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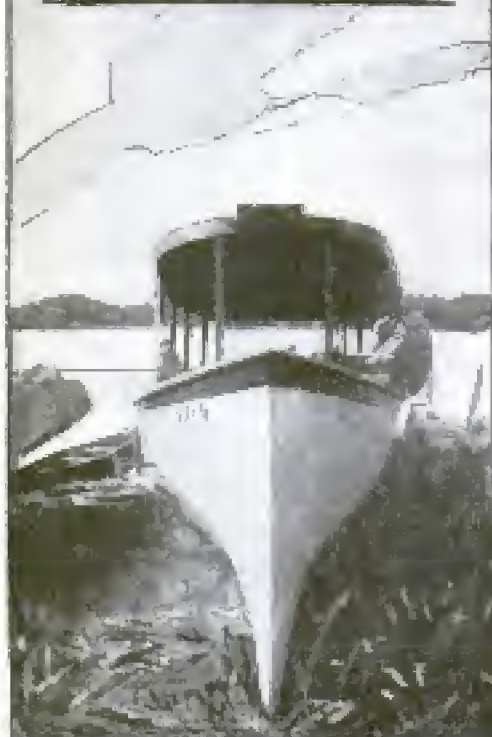
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In Square—Side view of stern of the Cypress Launch "Mary M."—before launching.

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Popular Mechanics Magazine

6 N. Michigan Avenue, Chicago, U. S. A.

H. H. WINDSOR, Editor

London: Hachette & Co.,
16-17, King William Street, Charing Cross, W. C. 2

Paris: Hachette & Co.,
111 Rue Renausart

Melbourne, Australia,
The Australasian News Co.

ISSUED MONTHLY

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All subscriptions are discontinued at expiration. Please examine the date printed on your wrapper.

Entered as Second Class Matter Sept. 15, 1903, at the Post Office at Chicago, Illinois, under Act of March 3rd, 1879.

Entered as Second Class Matter at the Post Office Department, Canada.

Published monthly by POPULAR MECHANICS CO.

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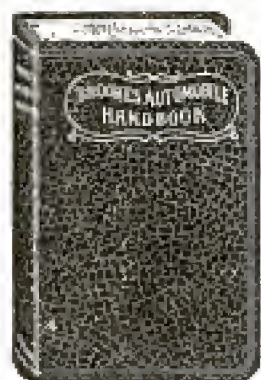
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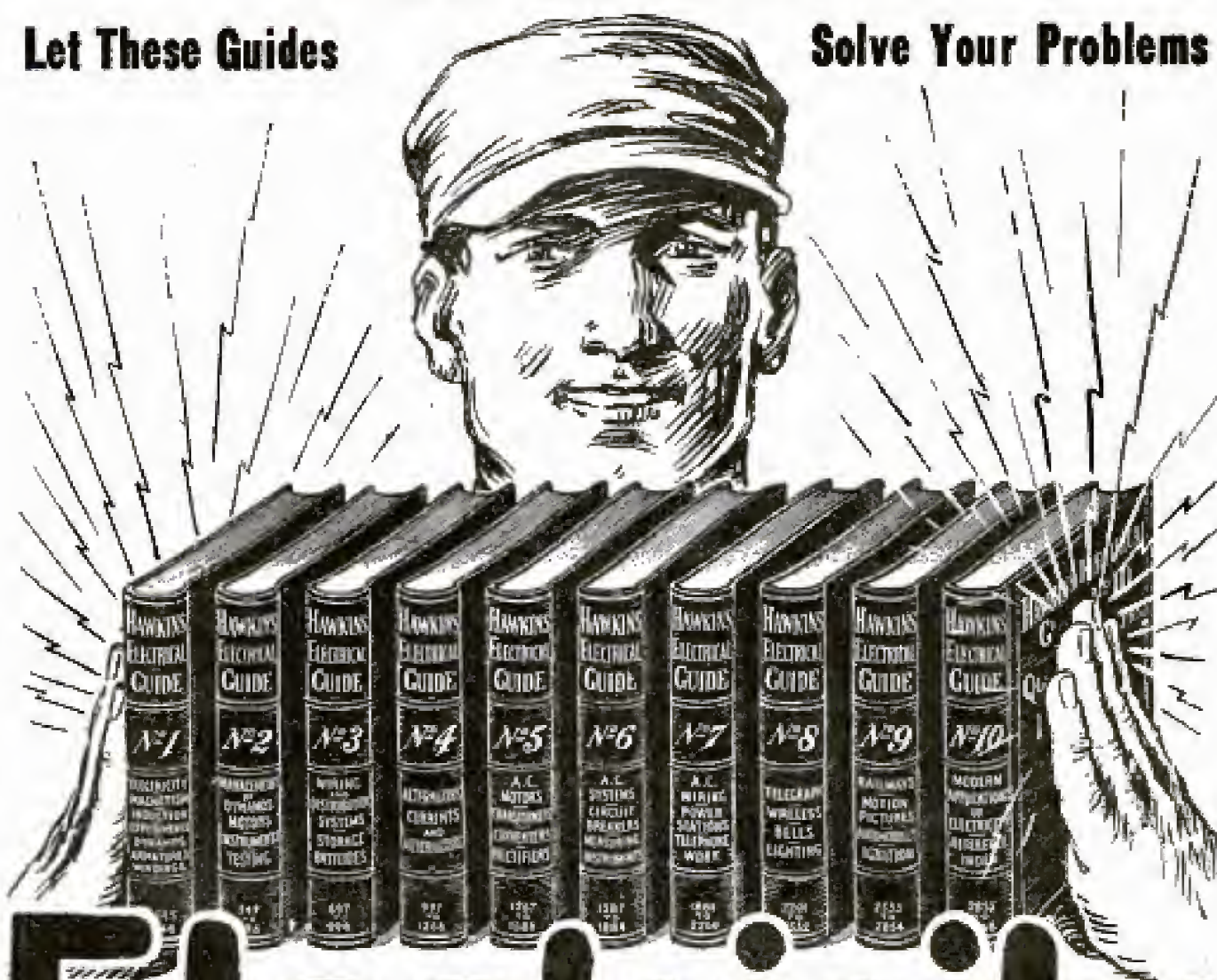
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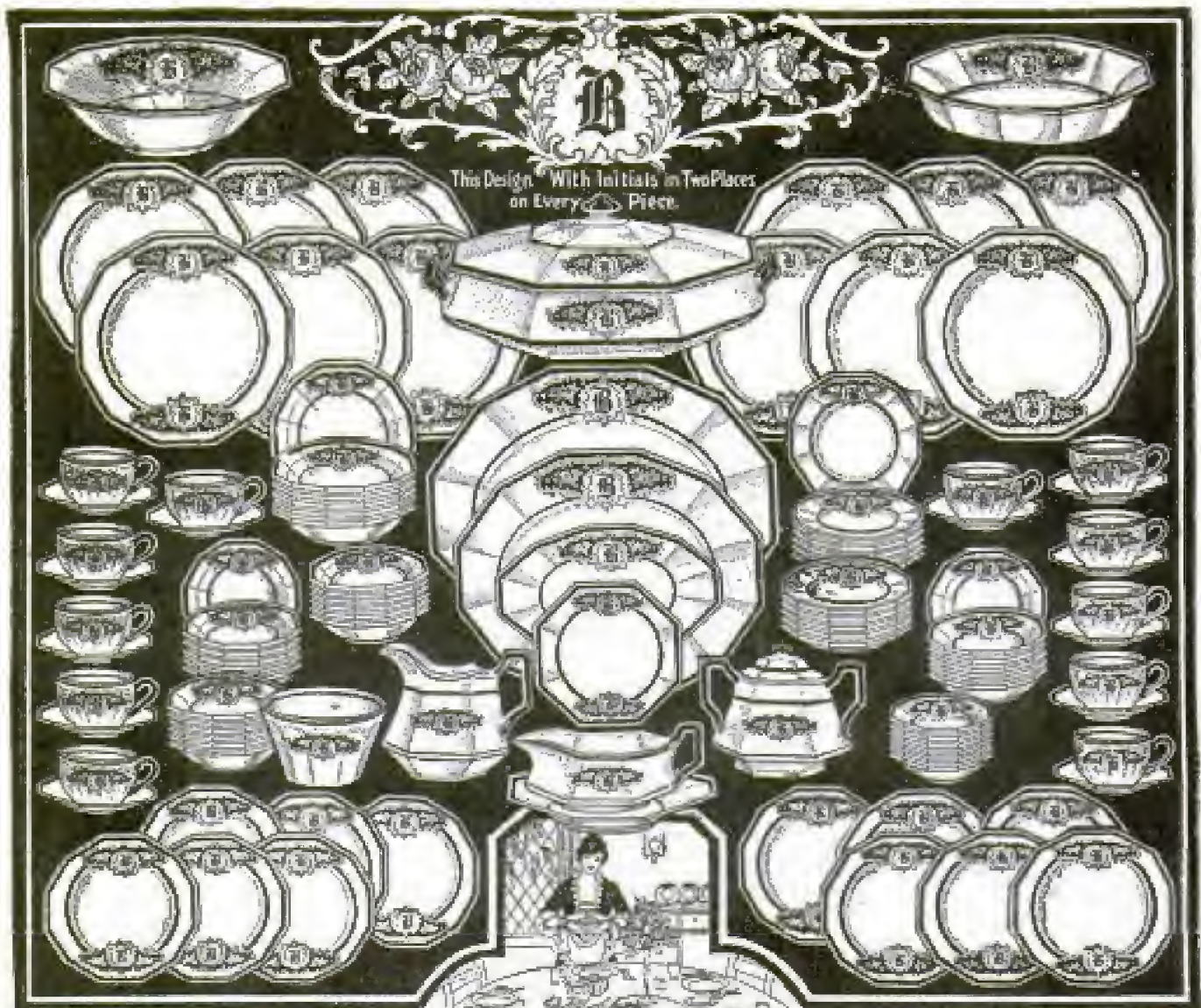
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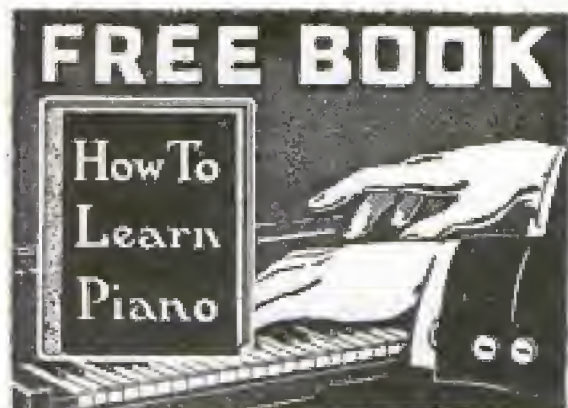
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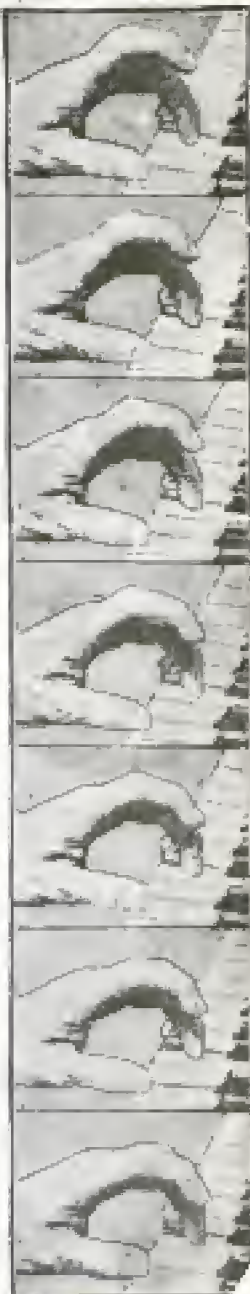
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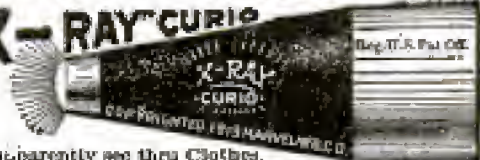
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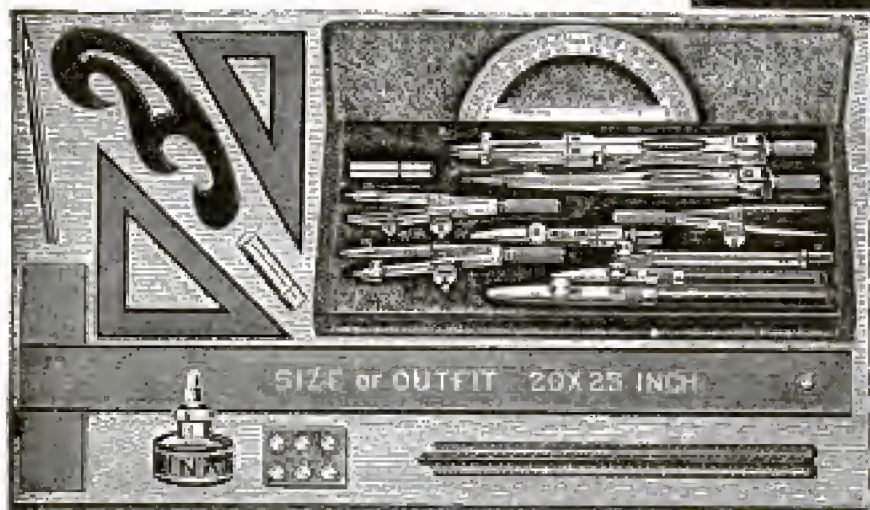
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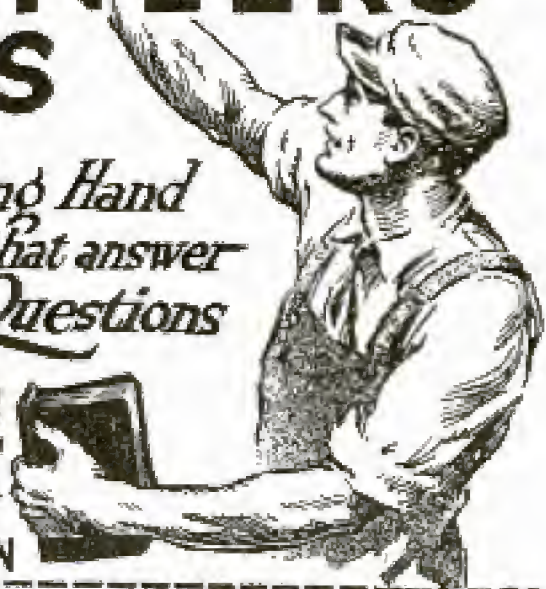
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JAN. 22

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We teach you practical electrical engineering from the ground up by the "learn-by-doing" method. In 98 days we teach you more about all phases of practical Electrical Engineering than you can learn about any one phase of it in years by any other method.

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The best proof that practical Electrical Engineering is the profession and that the Coyne School is the place to learn it, is the splendid success made by Coyne graduates. Untrained men, who don't know a dynamo from a dry-cell, come to this school and after 98 days instruction under the Coyne method go out into actual work and in a short time are commanding from \$150 to \$400 a month, and, in businesses of their own, much greater sums.

No Previous Experience Necessary

You don't need to know anything at all about electricity to enter Coyne. Nor do you need to have any considerable schooling. We have no classes; use no books. We teach by the most practical methods. Our instructors, all electrical experts, work with you in the actual doing of the thing to be learned. They tell you **what** to do, **how** to do it, and **why**. You pass along from the simplest task on signal bells to the finishing work on the monster dynamos, just as fast as you can learn. (And you can spend as much time over the 98 days as you wish, without extra cost.) Here you work with your hands just as you will when you get on the job after graduation. The Coyne method of teaching practical Electrical Engineering is not only the most efficient, but the simplest and quickest known.

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To a few young men from each locality who enroll within a limited time we have a most attractive and unusual offer. Those who act at once can get absolutely free a complete course in Business Management at America's greatest school of business, also our complete course in automobile electricity—the latest training in America on lighting, ignition and starting systems as used on autos, tractors and trucks and in battery making and repairing. Either of these courses alone is worth the price asked for all three. Write at once for full particulars.

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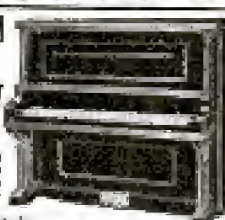
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Rapid advancement. "No lay-offs." THE POSITION IS YOURS FOR LIFE.

Country residents and city residents stand the same chance. Common-sense education sufficient.

Write immediately for schedule showing the places and dates of ALL COMING Government examinations. Don't delay. Every boy or man over 16 should write.

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.. Railway Mail Clerk (\$1400 to \$2300)
.. Postoffice Carrier (\$1400 to \$1800)

.. Postoffice Clerk (\$1400 to \$1800)
.. Rural Mail Carrier (\$ 720 to \$2600)

Name _____ Address _____

Use this before you lose it. Write plainly.

How I Found a \$10,000 Job in a Waste Basket

Truth is often stranger than fiction as evidenced by the fact that I found an opportunity in a waste basket that quickly placed me in the \$10,000 a year class.

By Philip Wilson

IF anyone had told me a couple of years ago that I would be in the position I am in today it would have made me sore, because at that time my prospects did not amount to a row of beans. After ten years drudgery as a bookkeeper I was only earning \$35.00 a week. Further promotion was almost impossible and even if it came my way, it could only mean five or ten dollars more a week at the most.

From morning until night I worked on endless rows of figures, punched the clock on my arrival and again on quitting. Frankly, I was sour on life. And then, as though by a touch of magic, my entire prospects changed—thanks to a dilapidated old waste basket.

And now for the other side of the picture. At the present time I am earning about \$10,000 a year, have a comfortable home, earn enough to enjoy the luxuries that make life worth while, have a bank account that is growing each month, to say nothing of the fact that I am engaged in work that seems like play, that fascinates, thrills and enables me to live like a gentleman.

The funny part of it is that if anyone had told me two years ago that I could make good in my present profession, I would have scorned the idea as impossible.

I Suddenly Find My Big Chance

I found my opportunity in a waste basket. In my case I was eating lunch in our stock room because I could not afford to go to a restaurant. In the corner of the room I noticed a waste basket. Sticking out of it was a dirty looking old magazine. Not finding anything of interest among the articles, I idly turned over the advertising pages when something stopped me. For fifteen minutes or so I studied the page before me carefully. Then I took it over to the stock room clerk.

"What do you think of this, Jim?" I asked.

Poor Jim, who is still in that stock room, only read the headline and sniffed in contempt.

Anyway the advertisement set me thinking although my negative condition at that time made me feel somewhat the way Jim did. But anyway, I ripped that advertisement out of the magazine and stuffed it in my pocket.

Several times that afternoon I pulled it out and studied it carefully. Every time I read it my pulse quickened, because it laid all, it pointed a way for me to increase my earning power many times over, to say nothing of getting away from the drudgery of bookkeeping.

"Why couldn't I do the same?" I asked myself.

Then Old Man Negative whispered in my ear that I was foolish to even think about it—that I was not cut out for it. So I put the advertisement in my desk and for the time being I forgot it.

Several weeks later I ran across it again and this time I noted. I mailed the coupon in for particulars.

The Secret of My Success

What was responsible for my remarkable increase in earning power? What did I do to lift myself out of the low pay rut and step into magnificent earnings? I got into the great field of selling through the aid of the National Salesmen's Training Association—an organization of top

notch salesmen—agers and salesmen, formed just for the purpose of showing men how to become master salesmen.

Through the help of the N. S. T. A., hundreds of men have been able to realize their dreams of success, health, and independence. Men without previous experience or special qualifications have learned the secrets of selling that make star salesmen—for salesmen are not "born," but made, and any man can easily master the principles of salesmanship through the wonderful system of the National Salesmen's Training Association. On record in the Association files are hundreds of letters similar to the few shown on this page. The most amazing part of it all is that these successful men had no previous selling experience before the N. S. T. A. trained them and helped them secure sales positions.

In my own case for instance, it may sound like a fairy tale but at the end of my first month I received a letter from my salesmanager congratulating me on my success. I had made a record for my territory.

Previous Experience Unnecessary

Salesmanship is not a natural gift—it is an Art and Science that is open to any man of average intelligence. There are many fundamental rules and principles that anyone can learn and put into practice. There are certain ways of doing and saying things in selling and once you are master of these selling secrets, the world is before you. The man who understands the underlying principles of salesmanship has a two fisted grip on prosperity.

A Great Book on Selling Sent Free

The interesting book "The Knight of the Grip" will be sent absolutely free to those sending in the attached coupon. This valuable book tells you all about the N. S. T. A. method of Salesmanship Training and Free Employment Service. In addition, you will read of the big opportunities open for you in the selling field and personal stories of men from all sections of the country and from all trades and professions who have suddenly stepped from small pay jobs to magnificent earnings as a result of the N. S. T. A. system.

Simply fill out and mail the attached coupon and "The Knight of the Grip" will be promptly mailed to you.

National Salesmen's Training Association, Dept. 12-A, Chicago, Illinois.

National Salesmen's Training Association,
Dept. 12-A, Chicago, Ill., U. S. A.

Please send me, without any obligation on my part, your free book, "A Knight of the Grip," and full information about the N. S. T. A. system of Salesmanship training and Employment Service. Also a list showing lines of business with openings for salesmen.

Name.....

Street.....

City.....State.....



Philip Wilson, who tells on this page how chance brought to him, from a dilapidated old waste basket, the secret that suddenly lifted him out of the pay to wonderful success and big earnings.

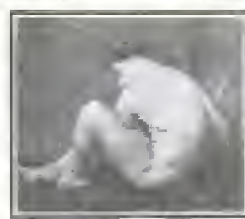
What Others Have Done

\$524 in Two Weeks.
I had never earned more than \$50 a month. Last week I cleared \$524 and this week \$218. You have done wonders for me.—Geo. W. Evans, 107 W. Park Place, Oklahoma, Okla.

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I took your course two years ago. Was making \$15 a week clerking. Am now selling many of the largest firms in the U. S. I have earned more than \$100 a day. You secured me my position. Our Sales Manager is a graduate of yours.—J. L. De Bova, 1028 S. Crawford Ave., Chicago, Ill.

\$1,562 in Thirty Days.
My earnings for the past thirty days are \$1,562.00 and I was Second Prize in Staro although I only worked two weeks during that month.—C. W. Campbell, Greenville, Pa.

Can YOU do



THE illustrations appearing on this page are but a few of the many photographs appearing in my booklet "MUSCULAR DEVELOPMENT." These are all photographs of my pupils showing the development which they have attained by faithfully following my instructions.

Chicago, Ill., Dec. 2, 1920.

My Dear Mr. Liederman,
I received my last lesson this morning and I wish to thank you for the kind, friendly interest you have shown me in the past. I have improved my condition better than I ever anticipated and you will find me always glad and willing to recommend your course to anyone.

Yours truly, Dr. J. G.

Vancouver, B. C.
Oct. 30th, 1920.

Dear Mr. Liederman,
You asked me to measure myself and I have done so. I am now happy to tell you that I have lost seven inches around my waist since taking your course and the fat around my hips and thighs is nearly all gone. I did not imagine when I enrolled with you that I could accomplish such splendid results. I think now if I lose another 5 or 10 pounds, I will weigh what I have always wanted to.

Again accept my thanks,
Yours truly, W. J.



Detroit, Mich., Nov. 17, 1920.

My Dear Mr. Liederman,
I received my first lesson, and you cannot imagine how pleased I am with the work you outlined for me for the first week. They certainly are real muscle building exercises as you stated they would be and I know I am going to make rapid progress. I feel stronger and better already.

Your Pupil, E. C.

Philadelphia, Pa.,

Nov. 16, 1920.
Mr. Liederman,

Dear Friend,
Received your final lesson and have completed your course. I thank you very much for the fine training you gave me. You have made a real man of me and have enabled me to defeat many of my friends in strength. I am very much pleased with your course and thank you for all your kind letters and the help you have me.

Wishing you luck and success in your life's work,
I am, Your friend, A. C.

Cincinnati, Ohio,
Oct. 31, 1920.

My Dear Instructor,
I thought I would write you and let you know how I am getting along. I have been following your course three weeks now and my arms have gained over an inch. I have also gained three inches on my chest and one-half inch on my neck. Your course is certainly doing wonders for me.

Looking forward with interest to the next lesson, I am,
Your faithful pupil, J. F.

Cleveland, Ohio, Oct. 31, 1920.

My Dear Mr. Liederman,
I received your exercise this morning and it is everything you claim it to be. It surely is the greatest muscle builder to be had, and I am so glad I am one of your pupils for I know you are going to make a real athlete of me. Your letters are frank and straight from the shoulder.

I am going to send you a photograph of myself in a few weeks as soon as I have time to get one taken.

Wishing you success, I am
Most Sincerely, J. McK.

Earle Liederman, 203 Broadway, New York, City.

Dear Sir:

I have recently had occasion to thoroughly investigate your splendid course, and I believe that in departing from the old time-worn methods you have worked out a system which is equalled by none.

I have found several of your original exercises to be remarkably effective. There is no reason why anyone following your instructions should not rapidly attain perfect muscular development and abounding health.

Accept my congratulations, and my best wishes for well merited success. Very truly yours,

TEX O'ROURKE.

November 10, 1919.

There must be some value to my system of training when such famous men as Tex O'Rourke, who is one of the world's leading authorities on physical culture and who is undoubtedly the foremost trainer of the world's champions, recommend it.

For further particulars of Earle E. Liederman see page 143

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these things?

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Anyone can obtain a splendid muscular development—it is simply up to themselves. I have taken hold of hundreds of weaklings and turned them into powerful athletes in a remarkably short time. I have turned hundreds of men and boys of average build into famous strong men. **Some of the strongest men of the present day are my pupils.** What I have done I am still doing every day, and if YOU—who read this, really desire to become a strong, well-developed man, I will explain how you can be one, in my latest book, "MUSCULAR DEVELOPMENT."

The best time to begin training is between the ages of 15 and 25. A young man is then growing and his muscles respond rapidly to systematic exercise. The man between 30 and 40 should not feel that he is too old, however, for at this age a man should be at his best. If he will pitch in and train systematically and determine to make the most of himself, he can positively develop and become just as strong as any YOUTH. The main thing is to do the right thing in the right way and my course has proven itself to be THE CORRECT WAY.

Hundreds of my pupils have tried other methods and failed. Why do they come to me? There must be a reason! They realize that my methods are the quickest and best for obtaining a splendid development.

I begin where others leave off. That is why I am successful. After a few weeks my pupils feel the energy and PEP that only an athlete knows.

No matter how badly you may be suffering from constipation, indigestion, nervousness, or lack of vitality, in a few weeks' time I can make A REAL MAN OF YOU; and cause you to experience the joy of living.

You just have to get strong—that is all there is to it. Going through life with a sickly, weak body will never get you anywhere. The successful man is the man with PEP—PERSONALITY—APPEARANCE—STRENGTH and ENDURANCE. That's the makings of a real American man!



LATEST PHOTOGRAPH OF
EARLE E. LIEDERMAN

The Eighth Edition of My Book "MUSCULAR DEVELOPMENT"

is just off the press, and I will gladly send a copy to anyone who will tear off the coupon attached and mail to me with 10c (stamps or coin) to help cover cost of postage, wrapping, etc. This little book is handsomely illustrated with 26 full page photographs of myself and of some of the well-developed men and boys whom I have trained. **Send for your copy today—now—** while it is on your mind.

EARLE E. LIEDERMAN

305 Broadway Department 2001 New York City

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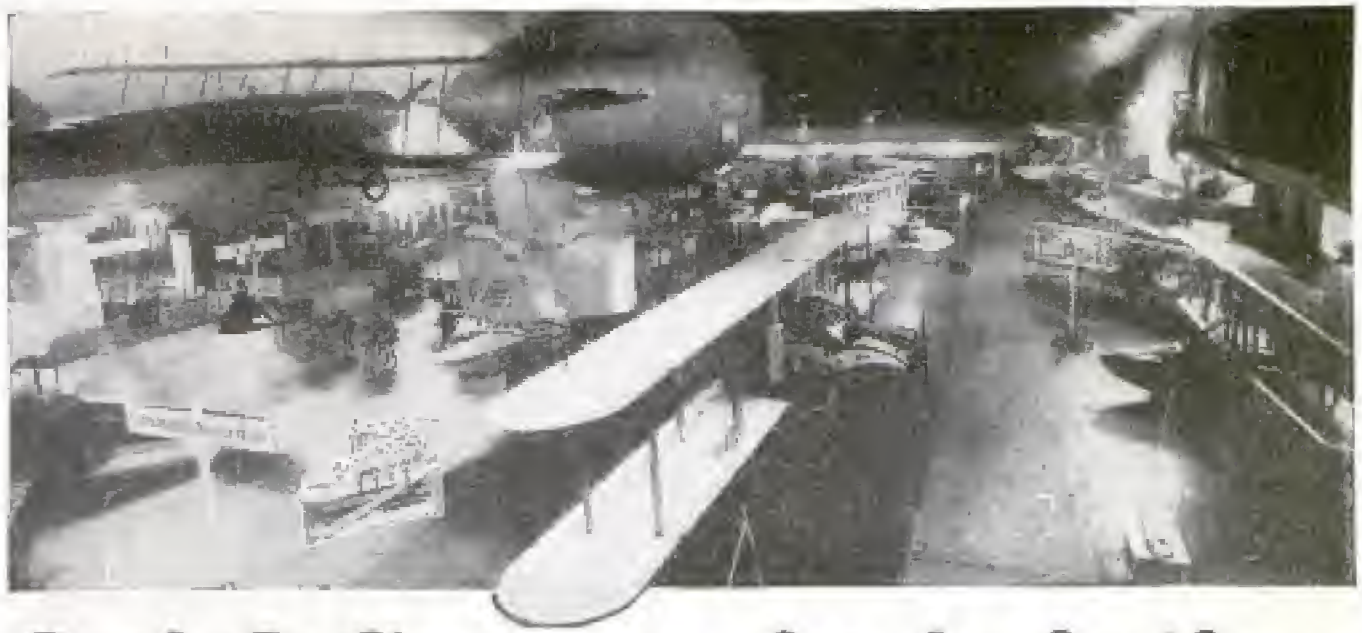
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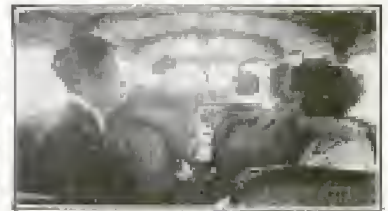


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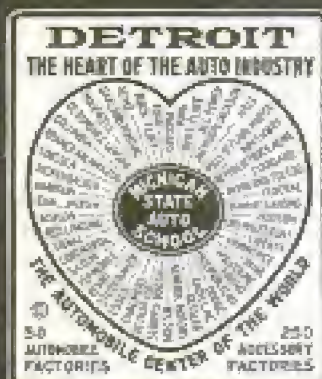
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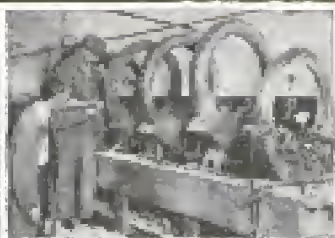
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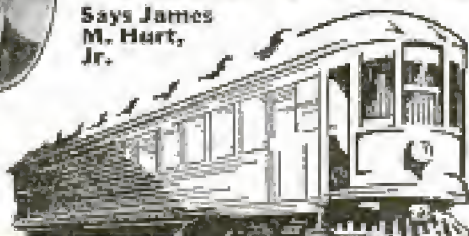
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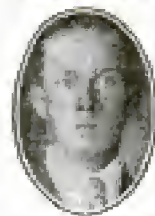
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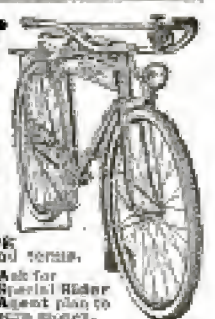
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AGENTS—Sell the New Naco Combination Filter—100% profit—Nothing like it. The Master tool of the age. Auto owners, Garagemen, Mechanics and Repairmen. Exclusive rights to responsible parties. Send \$1.50 for sample and full details. Address Naco, Box 462, Gales, Ill.

AGENTS! A sale in every home for our beautiful dress goods, silks and general yard goods. Quick sales! Big profits! Large book of 1000 handsome fabric samples. Write today. National Importing & Mfg. Co., Dept. 6X, 573 Broadway, New York, N. Y.

AGENTS on our staff are making \$100 to \$200 per week. You can do the same with our sanitary rubber specialties. Write immediately for particulars and exclusive territory. Paramount Rubber Co., Branshaw Bldg., Pittsburgh, Pa.

PROTECT your rights. Write for "Record of Invention" which contains form to establish evidence of conception of your invention. Prompt personal service. Preliminary advice without charge. J. Beatty Kelly, 6123, Columbia Building, Washington, D. C.

EXCLUSIVE rights to live agents on universal fabric cottons. Mends socks and clothing, rubber and leather without needle and thread. Sells to housewives and merchants. Big profits. Intersales Company, 601 Whitney Bldg., Detroit, Mich.

GENERAL Agents, Something New, Whirlwind seller. "Repeat" washing powder. Washes clothes without rubbing. Women throw away washboards. Big profits. Exclusive territory. Write today, free package. Kirtledge Co., 8 Piquan St., Piquan, Pa.

GUARANTEED brushes: 113 different kinds—household—commercial—auto. Tremendous sellers, everyone a prospect. Permanent business—Steady income. Write or wire Desk 6, Universal Brush Company, 181 Quincy Street, Chicago.

AGENTS: Sell Walther's Laundry Soap: 150 other household necessities. Big line, big profits. Quick repeaters. Free instruction. Write quick for terms. Walther's Soap Co., 238 Water St., Portland, Me.

AGENTS—New patented article. Enormous profits. Everyone a prospect. Sample 10c. GHS, 3551 Fifth Ave., Chicago.

RUST-1-CIDE Removes Rust—Chemically. Patented. Kills Iron and Steel's worst enemy—unlimited sales field. Booklet free. Send 25c for 75c bottle postpaid. The Rusticide Co., Cleveland, Ohio.

AMBITIOUS Agents everywhere. Complete line rubber goods. Belts, aprons, bags, household specialties; everything. Belts and other samples 25c. Nu-Line Products Co., Box 258, Akron, Ohio.

SELL articles of Universal Merit. Marvelous convenience, absolute necessities. Dealers make \$150.00 weekly. Exclusive territory; reliable merchandise, with no competition. Flexo Mfg. Corp., Sheboygan, Wis.

WANTED—Sales Agents. Both Sexes. Capital or experience unnecessary. Qualifications, common sense and willingness to work. Write for free details. Sanitary Mfg. Supply, Akron, Ohio.

AGENTS Wanted, to sell an improved tool that often pays for itself first time used. Address today, J. 1019 Georgia St., Los Angeles, Calif.

\$150.00 WEEKLY: Learn automobile Re-finishing Business. Bonafide Practical Painting, Re-habilitating Tops, Clean-up courses. By Professional Experts. No experience required. Automobile Finishing Corp., Sheboygan, Wis.

DISTRICT Agents everywhere, for new patented low-priced time-saving office necessity. No competition; big profits. Exclusive contract. Metal Goods Corp., Dept. 100, St. Louis.

COMBINATION floor and wall broom going like wildfire. Commission over 50%. Outdoors for corn brooms. Convenient shipping points. Address Harnack Co., Baum Building, Fort Worth, Tex.

PATENT for sale or royalty. Improved Combination Tool, useful to all Merchants. Big seller. Address Alex Miller, 132 N. Weber St., Colorado Springs, Colo.

AGENTS, sell newly invented Pie Trimmer and Crimper. 100% profit; sample and particulars 25 cents. Don Hisk, 1378 W. Colfax Ave., Denver, Colo.

ONE Man wanted in each county to sell direct to user complete line of paint and paint specialties, also King-Tite Adhesive Roof Cement, most successful product for waterproofing any type of roof. Big demand in town and country; anyone can sell. Permanent business that will make you \$3,000 or more per year. No capital required. We ship and collect. Commission advanced. King-Tite Products Co., 557 Tacoma Bldg., Chicago.

125 DAILY. Every Demonstration means sales. Finest improved only \$1.00 Double Edge Razor. Like \$5.00 type. Standard Safety Razor Corp., Pittsburgh, Pa.

NEW—Ice-pick holder; nothing like it; needed in every home. 15 cents for sample. M. C. Wakefield, 1110 Hall, Dallas, Tex.

SELL Vic's Letter Strips. The most sensible means to learn to write. Children delighted. Parents pleased. Address Vic Hansen, Wallace, Idaho.

YOU Can Succeed with our Formulas, Trade Secrets, Commercial Information. Particulars free. Address The Thady Co., Dept. 15, Washington, D. C.

AGENTS, good 50c seller; auto necessary; costs you \$1.00 per dozen postpaid. Dublins, 324 River St., Chicago, Ill.

EASY Money Interviewing business men—Jiffys needed everywhere; new; unique; efficient; write to Jiffy Letter File, Rochester, N. Y.

WANTED—Agents; Sell Books; Catalogs 10c. McCarthy Co., Kellogg, Minn.

SELL Multimend for tires and tubes—cost 2c. Repair; surpasses vulcanizing, saves 500%. Every auto and accessory dealer buys. Profits amazing. Show made \$23 first day. Last \$135 first week. Particulars and free sample. The Continental Rubber Co., Dept. 85, Philadelphia, Pa.

\$20.00 PER Day can easily be made at home manufacturing gold lace, and supplying wholesale and retail trade, milliners, dressmakers. Any one can do the work. Quicks complete. \$5.00 prepaid. So confident am I that you will be pleased I refund money in full to any purchaser not satisfied. Process fully explained; buy material for work anywhere; a few dollars starts you in business; this is something new, so hurry; a limited number to be sold; no orders accepted after 1st day of February until further notice. W. Brunson, 611 Yonge Street, Toronto, Canada.

AGENTS: \$40 a week selling guaranteed history for men, women and children. Must wear 12 months or replaced free. All styles and colors, including finest line of silk hose. Mrs. McClure makes over \$2000 a year. Mrs. Schumann averages \$60 a month working spare time. Gen. Noble made \$25 in one day. Write for sample outfit. Thomas Mfg. Co., Class 562, Dayton, O.

AGENTS—Steady income, large manufacturer of Soaps, Perfumes, Toilet Articles and Pure Food Products, etc., wishes representatives in each locality. Manufacturer direct to consumer. Big profits. Honest goods. White or spare time. Cash or credit. Send at once for particulars. American Products Co., 5721 American Bldg., Cincinnati, Ohio.

O-BELL-O, why didn't I see this before. \$1 an hour selling new product. Removes iron rust, solder, freck, ink, medicine and grass stain. Write for free sample and terms today. C. H. Stuart & Co., 24 Broadway, Newark, New York.

AGENTS—We pay \$6 a day taking orders for New Keroga burner. Fits any stove. Burns coal oil. No experience or capital required. Work spare time or full time. Write for demonstration sample. Thomas Mfg. Co., Class 2642, Dayton, O.

SALES Agents. Men or women. \$200 a month. Year round position. No inventory. Take orders for Jennings New Style Hosiery. Written guarantee of satisfaction or new hose free. Write for outfit. Jennings Mfg. Co., Dept. 268, Dayton, Ohio.

AGENTS: \$8 a day taking orders for Empire Tire repair. Absolutely guaranteed. Build up a big permanent business. Biggest opportunity ever offered to our Representatives. Write for territory and free sample. Parker Mfg. Co., 378 Buck St., Dayton, Ohio.

AGENTS, Wireless Umbrella. I am paying \$2 an hour, taking orders for this new invention. Send for 5-part outfit, six-inch midsize demonstrator free. Parker Mfg. Co., 378 Buck St., Dayton, Ohio.

WRITE for money making proposition selling holiday novelty. Address Enterprise Machine Works, Spring Valley, Minn.

AGENTS—\$8 cents per hour. Demonstrating and taking orders. No experience necessary. Selfert, a mechanic, made \$5.00 first day out, with new patented Moore Automatic Self-Winding Clothes Line and Reel, improved by Good Housekeeping; prevents dirt, knots and tangles—used indoors or out. Don't overlook this—let us prove it best money maker. Sample free to workers. Universal Appliance Company, Dept. 120, 425 Elm St., Cincinnati, Ohio.

ASK the Ideal Clothes Line Co., Clarksburg, W. Va., for their proposition, or send 50c for sample and particulars.

AGENTS: \$8 a day taking orders for New Heat Indicator for city and county homes. New invention. Tells exact heat in any room. No guesswork when baking or cooking. Big seller. Every housewife wants one. Write for sample. Jennings Mfg. Co., Dept. 1263, Dayton, Ohio.

AGENTS making \$3.75 hourly. You can too; 50c specialty, 800% profit. Men, women, buy at sight. Every customer a booster. Put up under your own name, enormous repeat orders. Too busy to answer inquiries unless 50c included for sample, particulars. Manager, 4035 Minnehaha, Minneapolis.

PORTRAIT Men. Lots of fine artists out of work in Chicago. Time to get best work at low prices. Frames down in price, photo pillow tops, also luminous cutlery too. Portrait Supply, 308 South Kilbourn, Chicago, Ill.

STOP Selling other people's goods! Big money easily earned making and selling your own products to consumers, to agents, by mail. Start small, grow big with reliable formulas and winning sales plans. Kolper, 607 Forrest Bldg., Philadelphia.

PORTRAIT Agents—Earn Big Money selling our Photo Medallions. Everybody buys. You charge \$3.00; make \$2.40 each sale. \$10 daily easy. Big variety designs. Quick service. Write Puddin' & Perry, Incorporated, Section 16, 360 Bowery, New York.

HIGHEST grade device of its kind. Something different. A rear signal for automobiles that positively insures safety. Send \$2.00 for sample and exclusive territory proposition. The Gravity Carburetor Co., 3062 E. 93rd St., Cleveland, Ohio.

BUILD Permanent Business following our Sure Success Plan introducing Guaranteed Hosiery and Underwear from factory to family. Attractive outfit assures quick sales. Large profits. Investigate for yourself. Address C & D Company, 41-B, Grand Rapids, Mich.

Big Money—Broken arms, cranking accidents prevented by Non-Kick Device for Ford. Burnett sold 144 in two weeks; made \$216. Write for particulars—exclusive territory. Non-Kick Co., 701A Central, Kansas City, Mo.

FASTEST Selling Sanitary Brush Line in America. Huge profit-making opportunity for live workers, with advancement. Other specialties. Get complete details. Act quick. Best season at hand. A. A. Silver-Chamberlain Co., Clayton, N. J.

AGENTS See our display advertisement on page 142 in this magazine, then write us immediately. Wide awake agents need no other line. Address, Sales Dept., The Kazo Company, Cambridge, 39, Mass.

AGENTS, Specialty Men, sell "Presto" polishing cloth on demonstration. Every housewife buys at sight, profits big, repeat orders, sample free. Premier Products Corp., 1451 Broadway, New York City.

HIGHEST, fastest sellers. Every woman buys Hawkins' High Grade Toilet and Household Necessities on sight. 100% profit. Colonial Chemical Co., 631A Penn Ave., Pittsburgh, Pa.

A BUSINESS of Your Own—Make sparkling glass name plates, numbers, checkerboards, metal signs. Big illustrated book free. E. Palmer, 39 Worcester, O.

WE pay \$200 monthly salary, furnish rig and expenses to all who qualify introducing guaranteed poultry and stock powders. Barker Company, 2343, Springfield, Illinois.

AUTOMOBILE Accidents prevented by new invention; costs distributor \$2.50, delivered; retails at \$5; wonderful self-selling plan. Carl Brown, Manager, Dept. 32, Columbus, Ohio.

AGENTS make \$500 monthly; sell my bank pay checks, sales stimulants; no experience necessary. Get circular. Hamilton Sales Co., 316 Moffat Bldg., Detroit, Mich.

AGENTS, Salesmen, Carriers, \$10 per day selling our guaranteed Waterproof Aprons. \$1 per dozen; sample apron 50c. Meeker Sales, 102 Market Street, Newark, N. J.

MOVIE film souvenirs, whitened toilet. Agents selling movie, absolutely new. Great for crews. Sample, two-cent stamp. Temple, Mason City, Ia.

PORTRAIT Agents. How's this, Bronside proof prints at cost if we do the finishing. United Service Art, Station D, Chicago.

SELL "Chum" aluminum clutch pencils; cheapest on market. Big commissions. Sample 25c. Northern Specialty Company, 2053 Randolph St., St. Paul.

AGENTS, male and female, new line necessities for home, office, auto. P. O. Box 52, East Boston, Mass.

Big money made silvering mirrors and plating tableware. Outfits furnished. E. Berlin Laboratories, 286 Fifth Avenue, New York, N. Y.

AGENTS: Self-threading needles. Every home buys. 175% profit. Sample free. Maher Co., Dover, N. J.

FREE samples to hustlers. Mustarded Creme, Aspirin Tablets, Skin Lotion. Lankes, 2313 North Kildare, Chicago.

AS also lines nothing beats our can opener, spark plug, and other live specialties. All new. Big demand. Good repeaters. Smith, 1334 North American Bldg., Chicago.

\$100 WEEKLY with 500% profit Repeater easy. R Home, 1957 Warren, Chicago.

Big Profits Selling New \$2.50 Automatic Adding Machine. Absolutely accurate. Fully guaranteed. Quick sales. Ten daily easy. No competition. Pocket size. Business people everywhere positive customers. Thousands being sold. Tremendous demand. Here's high-grade money-maker. Bassett Co., 1458W Hollywood Ave., Chicago.

FOR the Holidays. Our Ex-Cel Luminous Cracklix which "shines in the dark" is the most appropriate gift of all. An instant to demonstrate and the sale is made. Big profits. W. G. Hannan Co., Dept. B, 57 East 18th St., Chicago.

AGENTS: 1921's greatest sensation. 11-piece toilet article set selling like blazes at \$1.75 with \$1.00 dressmaker's shears free to each customer. Get lined up for Christmas rush. E. M. Davis Co., Dept. 306, Chicago.

AGENTS, Men and Women, on Farms and small towns everywhere, sell high-grade necessity. The Dabrito light demonstrates its own superiority. Moderately priced. Guaranteed. \$75.00 to \$100.00 weekly. Sample Free. Billings, 1626B West 34th, Chicago.

AGENTS—Big money taking orders overcoats, pants, blankets, direct Woolen Mill to wearer. No deliveries. No capital required. A knockout. Donahue made \$27 first day. Complete outfit free. Taylor, Wells, 2740 N. Paulina, Chicago.

AGENTS—Make 100% profit! Wonderful Mikaloth sells on sight; polishes silverware without powder or paste; great opportunity for hustlers. Address Miller Brothers, Allendale, N. J.

WOULD good durable paints and varnish 50c gallon interest you? Then write today. Dept. 2, Brumelmann Bros. Mfg. Co., Indianapolis, Ind.

IF you need good live agents—fellows who can get the business—ask us how others are doing it. I'll gladly render the necessary assistance. J. Roy McClellan, Mgr. Classified Advertising, Popular Mechanics Magazine, Chicago.

AGENTS—Test Remedies 200%. Address Nat'l Remedy Co., 1331 Franklin, St. Louis, Mo.

AGENTS Make \$1.35 or more applying sets Lichogram Initials to automobiles, motorcycles, golf sticks, etc. Anyone can do the work in a jiffy. And everybody buys. Write today for particulars. Big money to be made. Lichogram Company, Desk 17, East Orange, N. J.

"FASTEST Selling" 50c Specialty, hotels, cafes, housewares. Sample, particulars 10c prepaid. Territory going fast. H. B. Paetzel, 4035 Minnehaha, Minneapolis.

AGENTS, Streetmen—Self-lit lights any day while user sleeps, or other time, by itself. Performs surprising stunts. Newly patented; 25c. postpaid; money back. Particulars. Kapwo Mfg. Co., Station A, Boston, Mass.

TANNING Cheap, quick way. Recipe Free. Agents wanted. R. N. Gilley, Carlton, Texas, Tanners.

SELL Something New. "The A-B-C of Business" for business men. 50c copy. Agent's terms. Forbes Kinghorn, 110 Howard St., Pittsfield, Mass.

AGENTS, Men or Women, full or spare time, earn \$25.00 to \$100.00 a week and be your own boss representing the Ho-Ro-Co Mfg. Co., manufacturers of the wonderful Ho-Ro-Co Tonic, the great blood purifier and system builder; some profit-maker. Ho-Ro-Co Medicated Skin and Scalp Soap for the baby, toilet, bath, skin and scalp; a restorer. Over 100 other fast-selling specialties, toilet preparations, perfumes, flavoring extracts, spices, medicinal preparations and household specialties. Every item a fast seller and a big profit-maker. Don't fail to ask for our free sample case offer. We furnish advertising matter and samples free of charge. Ho-Ro-Co representatives are successful. Write today. Ho-Ro-Co Mfg. Co., 154 Locust St., St. Louis, Mo.

AGENTS—Send for sample "Fretnot"—the washday wonder. Be convinced you can do a whirlwind business. You can clear at least \$25 to \$100 weekly, according to spare or whole time. You don't have to talk; if she doesn't buy at sight, leave sample; she will be looking for you long before you are able to make the pounds again. Samples furnished free. Premiums for your customers. Exclusive territory guaranteed to agents who can produce. Credits given. Don't call. J. M. Stutler & Sons, 20 E. Jackson Blvd., Chicago.

WONDERFUL Winter Auto Necessary Investment. \$1.00 sale means 75 cents profit for you. Experience unnecessary. Absolutely New Specialty. Bikes made \$109 three days. Stomach first hour made \$10. Every Automobileist buys after each quick demonstration. Carried in Pocket. Prevents Accidents. Better Service. Reduces Operating and Repair Expenses. Write Quick for Exclusive Territory and Free Sample. Secretary, Box 494, Hartford, Conn.

AGENTS—New Invention. Harper's Ten-Use Brush Set and Floor Beam. It sweeps, washes and dries upstairs windows, screens and mops floors and does all other things. Big profits; easy sales. Free trial offer. Harper Brush Works, Dept. X, Fairfield, Iowa.

EASY, pleasant work for Mechanics. Shop Men. Checks, during spare hours; will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 87 Bar St., Canton, O.

GOLD Leaf Sign Letters; make and sell; profits exceed 1,000%; immense demand; particulars free. Johnston Co., Quincy, Ill.

COIN Money Selling Nearest Shoulder Strap Waterproof Aprons. Every woman buys. Best on market. We manufacture and ship direct. Get details today. A. D. Hergen Manufacturing Company, 413 Locust St., Philadelphia.

"PEERLESS" Plate Glass Wind Deflectors give every car that "million-dollar" look. Most popular necessity ever invented. Handsome, Durable. Quickly demonstrated and attached. A fortune for live agents. Write Quick for liberal trial offer and illustrated booklet. Rapid Sales Corporation, 10-A, Grand Rapids, Mich.

ANY man handy with paint brush can start new mechanical business on nearly nothing; needed everywhere; nearly all profit; experience not required. John Brackland, 1457 So. Ninth, Philadelphia, Pa.

AGENTS—Clear Intention! Inkpen makes every pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marul Company, Tribune Bldg., New York, N. Y.

SELL washing tablets that are different. They work quicker, sell easier and at a greater profit. Get our proposition. Write Newton & Co., 1 Main St., Newark, N. Y.

WRITE for particulars: best article ever offered men; costs \$2, sells quick for dollar; \$15 daily; sworn statement. Branch, 22 Express Bldg., San Diego, Cal.

FREE—Formula Catalog. S. & H. Laboratories, Boylston Building, Chicago.

SELL, Necessities. Everybody needs and buys the "Business Guide." Bryant cleared \$800.00 in July. Send for sample. It's free. Nichols Co., Box 4-B, Naperville, Ill.

GOLD Sign letters for stores and office windows. Photo pillow tops, portraits, frames, sheet pictures, medallions, waterproof aprons, necessities. Samples, catalogue free. Thirty days' credit. James C. Bailey Co., Desk B11, Chicago, Ill.

AGENTS Wanted—Something New—Fire Fighter sells easily. Makes a spectacular demonstration—car owners, homes, factories, stores practically buy on sight. Our men make \$10 to \$35 a day—exclusive territory. If you wish to establish a business of your own with unlimited possibilities for making big money, write us today. Fry-Flyer Co., 153 Fry-Flyer Bldg., Dayton, Ohio.

AGENTS make 140% profit. Ironing (handmade) crucifix shines in the dark. Sells for \$2.00. Costs 84c. Complete line religious articles, crucifixes, bulbs, watch plates, house numbers and match boxes. Novel Ornamental! Useful! Every home a prospect. Big sales. Get free demonstrating outfit. The Pioneer Corporation, 1259 W. 63d St., Chicago, Ill.

KEES pay if kept right. It's a progress—see booklet. We can show you how. Send \$1.00 today for Bee Primer. 3 months subscription to American Bee Journal and catalogue of bee supplies. American Bee Journal, Box 62, Hamilton, Ill.

AGENTS. Canvasers, sell Verdina Face Powder and Toilet Necessities. Big profits. Permanent repeat business. Highest quality. Lowest prices. National Products Co., 410 E. 13th St., New York.

BEAUTIFUL new map of United States showing all transcontinental highways. Profit large. Send for particulars. Standard Map Company, 129 W. Ohio Street, Chicago.

SALESMEN and District Managers for tremendously successful new office article. Two minute demonstration means sale every office; 100% repeats. A gold mine for you. Perfection Mfg., 112 South Fourth, Philadelphia, Pa.

AGENTS to sell Kernsone Burners for all purposes. Big Profits. Kernsone Mfg. Co., 616 W. Monroe St., Chicago.

BE Successful Agent—Free sample worth \$2.25. "Quality" beauty preparations. Make big money. Extensive line. Established 50 years. Lynne Co., 216, Loganport, Ind.

WHY work for others? Make and sell your own goods. We show you how. Enormous profits. Write quick for free book explaining everything. National Scientific Laboratories, 415 Main, Richmond, Va.

SIGN letters for windows at honest prices. Genuine gold leaf. \$50 worth easily made. Chicago Sign System F., 150 W. Austin Ave., Chicago.

AGENTS make 500% profit handling Auto Monograms, New Pictures, Window Letters, Transfer Flags, Novelty Signs. Catalog Free. Write Hixson Co., Star City, Ind.

AGENTS: Men and women, in spare or full time, make big money selling household necessities. Every home a prospect. Quick sales, big profit. Territory open. Write for particulars. Judd & Leland Manufacturing Company, Box 21, Clifton Springs, N. Y.

AGENTS—Steady Income. Large manufacturer of Handkerchiefs and Dress Goods, etc., wishes representative in each locality. Factory to consumer. Big profits, honest goods. Whole or spare time. Credit given. Send for particulars. Frempst Mfg. Co., 59 Main St., Brooklyn, N. Y.

STOP Making Money for Others. Manufacture These Goods Yourself From Miller's Guaranteed Manufacturer's Formulas—Profits Enormous. Investment Small. Business Quickly Established—Stamp Brings Valuable Literature Regarding Mingle Winfield Cloth; Amazon Builder Repair Laundry; Rival, Huling Puddies, Mexican Yucca Soap, Food, Automobile, Household Specialties in all lines. Get this Valuable Literature. Miller Chemist (old Reliable, Established 1897), Tampa, Florida.

LARGE shirt manufacturer wants Agents to sell complete line of shirts direct to wearer. Exclusive patterns. Big volume. Free samples. Madison Mills, 863 Broadway, New York.

MAKE 600% Profit. Free Samples. Lowest priced Gold window letters for stores, offices. Anybody can do it. Large demand. Exclusive territory. Big future. Sideline. Active Letter Co., 2300-L Congress, Chicago.

AMERICO Rooster auxiliary water carburetor makes steam burn water. Eliminates carbon. Low cost; liberal profits; details free. Americo Co., Dept. 173, Cincinnati, Ohio.

AGENTS: Big Money Monogramming By Transfer Method. Catalogue Showing Over 50 Styles and Particulars Free. Motorists' Accessories Co., Mansfield, Ohio.

SELL Pudding Powders—Delicious dessert. Fast sellers; quick repeaters; big profit. Send for terms and samples. C. H. Stuart Co., 45 Union, Newark, New York.

AGENTS make one dollar per hour selling "No Loose Art Panels." Newest thing in art. Men with automobile make forty dollars per day. Tremendous demand. Write for samples and expense money. Consolidated Portrait Co., 225 North Green St., Chicago.

\$200 WEEKLY. Free samples. Sell gold sign letters to stores, offices. No experience. Big future guaranteed. Can travel. Exclusive territory. Become our general agent. Acme Letter Co., 2800D Congress, Chicago.

MAKE \$25 to \$50 Week representing Clow's Famous Philadelphia Dealers. direct from mill—for men, women, children. Every pair guaranteed. Prices that win. Free book "How to Start" tells the story. George Clow Company, Desk 31, Philadelphia, Pa.

YOU can better Automobiles, Deers, Trucks etc., without any previous experience by Transfer Process. Make \$27.50 on \$2.50 Outfit. Auto Monogram Supply Co., 18 Green St., Newark, N. J.

BEST Proposition on Earth. Kitchen Specialty Every Woman Wants. Nothing like it in existence. 200% profit. Best Novelty Mfg. Co., Dept. C, 166 N. Wabash, Chicago.

AGENTS and portrait men. Crew managers. We give you more for your money. Better and quicker service. Lowest prices on frames and glass. Rejects credited. Catalog free. The Pioneer Corporation, 1259-A West 62nd St., Chicago.

FAST-SELLING Sanitary Brushes. Mops. Dusters. Positively best house-to-house line in America. Write and be convinced. Sanford Brush Co., 544 W. Lake St., Chicago.

AGENTS make \$10 a day selling Presur-Town Trouser presser and creaser. Connolly, 116 Greenwich St., N. Y.

WE Start You Without a Dollar. Soaps. Extracts. Perfumes. Toilet Goods. Experience unnecessary. Carnation Co., 201 Olive St., St. Louis.

AGENTS: Big profits. Best and cheapest window letters made. Easily applied. Dime brings five samples. Particulars free. Stat-bello Co., 1115 Second Ave., New York.

PORTRAIT Agents: Our goods will make you big profits. Delivery guaranteed. Rejects credited. Prompt shipments. Send for latest catalog and prices. Adams J. Knib & Co., 602 Blue Island Ave., Chicago, Ill.

MAKE \$2 an Hour. Article that removes iron rust, grease, medicine, fruit, mildew stains. Cleans Panama and Straw Hats. Bleaches clothes. Sells Every home. Write for free demonstrating outfit and start taking orders at once. Christy, 81A Union, Newark, N. Y.

AGENTS: Big Returns. Fast office sellers; particulars and samples free. One Dip Pen Co., 2 Daily Record, Baltimore, Md.

WORLD'S Fastest Selling Auto Accessory! Cooney Distributors wanted; write today. G. L. W. Spring Older Co., San Diego, Calif.

AGENTS sell Laundry Tablets under your own name and brand. Free samples and circulars furnished with every order. Particulars free; sample, fifteen cents. Write today. Krebs & Products, College Point, N. Y.

PORTRAIT Agents, who want good work and prompt service and who desire to purchase their frames at factory prices, should write us at once for catalog and price list. W. C. Hanson Co., Dept. A-5, 57 E. 18th St., Chicago, Ill.

AGENTS—New patented curtain rod, necessary in every home; big profit; 4 to 10 sales at every house. Write for free sample. Home Curtain Rod Co., Providence, R. I.

CALIFORNIA Roadside selling like hot cakes. Agents earning money; new staff. Big profits. Catalog free. Mission Road Co., P.O. 2810, West Plac, Los Angeles.

AGENTS make a dollar an hour. Sell **Memlets**, a patent patch for instantly mending leaks in all utensils. Sample package free. **Collins Mfg. Co.**, Dept. 401-E, Amsterdam, N. Y.

AGENTS—Advertising **Proctis**, ready sellers, excellent sideline. Write for proposition. **North American Pencil Works**, 501 Plymouth Court, Chicago.

YOU can be your own boss with our **Key Check outfit**. Good for \$5 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address, 20 cents. **Pearse Die Works**, Dept. M, Winchester, N. H.

PATENTS—Write for our free illustrated guide book and Evidence of Conception Blank. Send sketch or model for our opinion of its patentable nature free. Highest references. Prompt attention. Reasonable terms. **Victor J. Evans & Co.**, 183 Ninth, Washington, D. C.

WANTED—Tailoring Sales Agent—Make big money from very start—\$40.00 to \$75.00 weekly. Largest made-to-measure tailoring house, furnishing an equipment of five hundred workmen, wants you to take orders. Satisfaction guaranteed. Biggest merchants in many towns have started with our line. If you want to establish yourself permanently in business and make big money write for full particulars, giving your experience as salesman or tailor's sales agent. **H. F. Foster**, Sales Manager, Lock Box 483, Chicago.

AGENTS—Best sellers: **Jem Rubber Repair** for tires and tubes; supercedes vulcanization at saving of over 800%; put it on cold, vulcanizes itself in two minutes, and is guaranteed to last the life of the tire or tube. Sells to every auto owner and accessory dealer. For particulars how to make big money and free sample, address **Amazon Rubber Co.**, Amazon Bldg., Philadelphia, Pa., Dept. 505.

AGENTS—If you are making less than \$300 a month our proposition on **Sentinel Burglar Alarms** for windows and doors will interest you. Many agents earn \$20 daily. Brand new inventions. No wires, batteries or bells. Instantly attached to any door or window. Handsomely nickel plated. Sell on sight. No competition. Provides cheap burglar insurance. Big money makers. Write today for extremely liberal terms to agents. **Sentinel Alarm Co.**, 140 S. Dearborn St., Chicago, Ill.

AGENTS—Stamping names on **Pocket Key Protectors**; sample Check with your name and address, 25c. **Stamping Outlets**, Emblem Checks, Check Fobs, Name Plates, **Emt Mfg. Co.**, Desk 2, 303 Degraw St., Brooklyn, N. Y.

MOST Wonderful Seller. 50c profit every dollar. No stock to carry. License unnecessary. Sample free. **Mission Bend Co.**, 1817 Italia, Los Angeles, Calif.

POLMET Polishing Cloth cleans all metals. Handles 25 cents. Sample free. **Gale & Co. Inc.**, 15 Eldorado St., Boston.

BIG money and Fast Sales. Every motor boss Gold Mine for his auto. You charge \$1.50; make \$1.25. Ten orders a day easy. Write for particulars and free samples. **American Monogram Co.**, Dept. 40, East Orange, N. J.

HIGH-GRADE SALESMEN WANTED

LEARN the secrets of **Star Salesmanship** and qualify for \$3,000 to \$10,000 a year as City or Traveling Salesman. Free Employment Service. Send now for free book about our amazing system, also list of firms. **National Salesmen's Training Association**, Dept. 1283, Chicago, Ill.

LIVE Wire Distributors and Dealers everywhere make money selling **Seal-Fast** three-tube repair kits because of the unequalled efficiency and our aggressive and helpful sales promotion and advertising cooperation. Write Sales Manager for particulars. **Robert M. Brown Co.**, Indianapolis, Ind.

SALESMEN: Make extra money easily. Sell our **Accident and Sickness policies** in your spare time. \$5,000 death, \$25 weekly benefit for \$10 yearly. Address **North American Accident Ins. Co.**, Dept. IC-25, Newark, N. J.

SALESMEN—Lowry Xmas Show Window Card Signs Now Ready—35 subjects—Every Business a Prospect. 150% profit. Sample 15c. **Lowry Signs**, 189 No. Clark, Chicago.

OIL Gauge for Fords. Remarkable new invention. Sells on sight. Big profits easy. Exclusive distributors wanted. Address **Sales Mgr.**, 82, Sta. C, Omaha, Nebr.

HIG Profits Easy. **Duplex Transformers** needed on every auto. Save gas. Easily sold. Exclusive Distributors wanted. Address **Mfg. Co.**, 22, Sta. C, Omaha, Nebr.

SALESMEN Wanted to sell **Roman Spark Plugs** on commission. A high-grade guaranteed plug. Side Eng. men desired. Write today. **Roman Spark Plug Co.**, Rome, N. Y.

SELL 21 1-lb. Cans **Yankee Hand Soap**. Profit \$5.00. \$2.00 brings first dozen. **Crystal Chemical Co.**, Newark, N. J.

SALESMEN, sell supplies boards of education. Liberal proposition. Exclusive territory. **Union School Furnishing Company**, 1023 Van Buren St., Chicago.

MANUFACTURER offers unusual opportunity to experienced sales manager capable of organizing crew to cover drug and grocery trade in your home territory. This is an opportunity of a lifetime for the right party. Product is fastest seller ever offered trade and the repeat business is simply phenomenal. Tremendous demand already existing with absolutely no competition. Profits should run from \$15,000 to \$25,000 per year. All replies considered confidential. State experience and qualifications fully. **Beardsley Specialty Co.**, Rock Island, Ill., Desk P.

WANTED—Foreign and domestic representatives to sell brand-new line of guaranteed garage tools. Exclusive territory. Send \$6 for the best universal timing gear puller on the market. Try it out and see how easily it sells. Money returned without question if you ask it. **Lehn Mfg. Co.**, 450 Stark St., Portland, Ore.

WANTED—Reliable men to act as our District Superintendents to look orders for fruit and ornamental trees, roses, shrubs, etc. Unrestricted territory. Commissions weekly. **Knight & Henshaw Nurseries**, Newark, New York State.

SELL something different; all business and professional men need it. Sells \$7.50, costs you \$1.50. Sure repeater. Exclusive territory. Sample free. **Merchants Assn.**, Minneapolis, Minn.

TAKE Orders for **Red Rooster** poultry feeds. Address **Northwest Co.**, Tulare, S. D.

WANTED—Salesmen—soups, gravies, etc.; old manufacturers **Baum's Casteries Co.**, Rome, N. Y.

ACCEPT this offer if you want real money. Sweet made \$652 last month. **Murphy \$638**. Largest company of its kind in America. Your profit \$3 to \$8 per order. We furnish full equipment. All you do is call on our customers and take their orders for famous all-weather coats. Big, permanent proposition. Spare time or full time. No capital required. Write quick for offer that will put you on the road to success. **The Corner Mfg. Co.**, Dept. W-55, Dayton, Ohio.

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LIBERAL Proposition for Live Men to act as general agent for fast selling line of food flavors, toilet articles, etc. Appoint sub-agents and receive commission on sub-agents' business. Write today for particulars. Address **C. H. Stuart & Co.**, 25 Broadway, Newark, New York.

REPRESENT Corporation. No selling. Markham left \$60 weekly position to accept this. Smith making over \$8 daily; earnings \$10 to \$75 weekly. Equipment furnished. Write for portfolio. 102 White Plains Ave., New York.

SALESMEN wanted, all or part time, for nationally advertised, copyright system of collection letters. **The Non-Dictating System**, Dept. P, Post Office Box 1949, Boston, Mass.

SPECIALTY Salesmen—In \$1,400 a month class to call on dry goods trade. Recommended. **Computing Yard Measure Company**, 36 N. Dearborn, Chicago.

FAST Selling articles appealing to colored people. Big profits to hustler. Write today. Colored agents preferred. Address **Yarborough Mfg. Co.**, Winston-Salem, N. C.

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VENDING Machines—Peanut, Match and Gum Vendors. Excellent Line—Big Commission. **Standard Adv. & Printing Company**, Ft. Scott, Kans.

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EVERYBODY Eats Every Day. You can handle **Sugar, Flour, Canned Goods, Dried Fruit, Coffee**, and entire line of groceries, as well as **Paints, Roofing, Aluminum Ware and Automobile Oil**, with no rent to pay; no money invested; take large orders from samples. Goods are guaranteed and proven quality. Selling experience not necessary. Steady, profitable work for "workers". Address **Bitchewick-Hill Co.**, Dept. 200, Chicago, Ill. Reference: Any Bank or Express Co.

57 MILES per gallon made with new patented **insuline Vaporizer**. Write for particulars. **Vaporizer Co.**, Pukwana, S. Dak.

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SALESMEN can make \$5.00 a day selling our **Pencils, Signs, Aluminum and Celluloid Advertising Novelties, Yard Sticks, Whistles**, etc. Liberal terms. Sells entire year. Fine side line. Local and traveling Agencies. **Model Calendar Co.**, Dept. 228, South Bend, Ind.

MAKE \$50 Daily. Something New? 400% Profit. All Business, Professional Men Need It. Sells \$5. Costs \$1. **Brooks, Texas**, sold 26 first day, profit \$60. Big weekly repeater. Sells quickly. Experience unnecessary. Write today for territory wanted. Sample outfit free. **Federal Association**, T-D Asylum St., Hartford, Conn.

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MEN—\$35 weekly for spare time, mailing letters; experience unnecessary. Send stamped addressed envelope for terms. E. Normande, 147 W. 23d St., New York, N. Y.

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WANTED—50 men to appoint agents for fast selling line of food products and toilet preparations—212 articles. State territory wanted. Write today for particulars. C. H. Stuart & Co., 26 Broadway, Newark, New York.

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YOU are wanted. U. S. Government Jobs, \$133-\$195 month. Hundreds openings. List free. Write immediately. Franklin Institute, Dept. W21, Rochester, N. Y.

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INVENTORS desiring to secure patents should write for our book, "How to Get Your Patent," tells our terms and methods. Send sketch for our opinion of its patentable nature. Randolph & Co., Patent Attorneys, 420 F. Washington, D. C.

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500 SHAVES from one hand-sharpened blade. Use Simplex blade holder, \$1.00 postpaid. State blade used. Mayne Company, 77 Brighton Ave., Boston, Mass.

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DEUTSCHE Records—and Swiss—Imported and American. Laendler, Marches, Yodeler, Operas, Home-Songs. Send today for Big List Free. Century Co., 1445 Second Ave., New York, N. Y.

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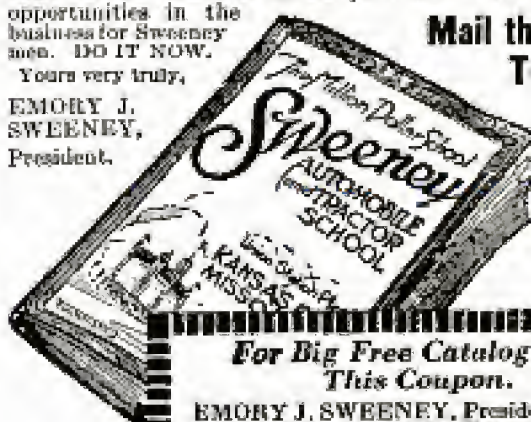
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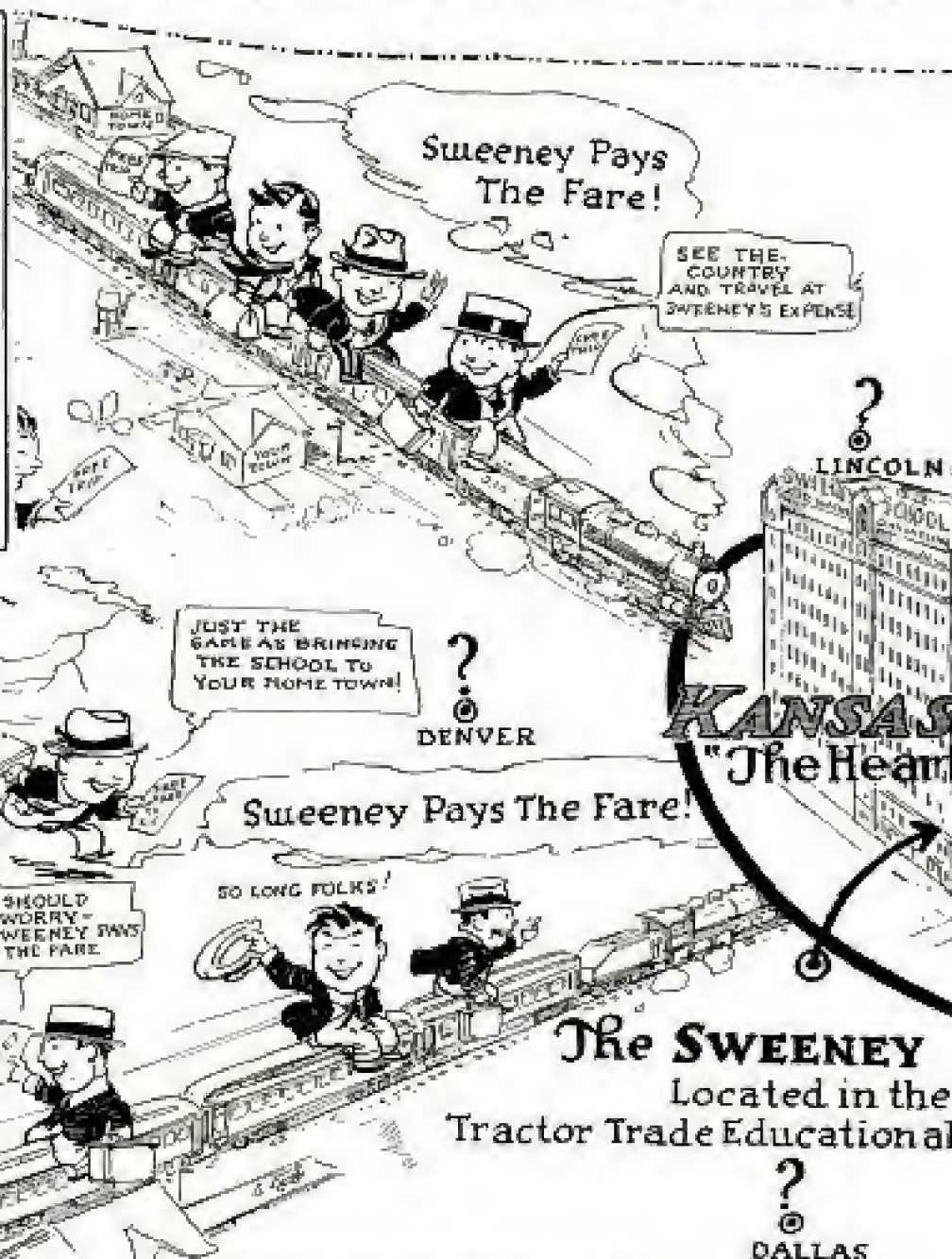
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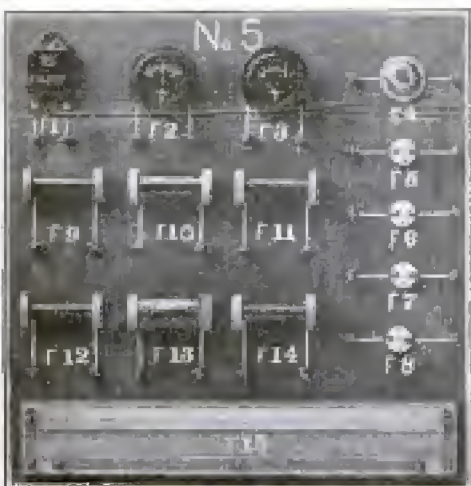
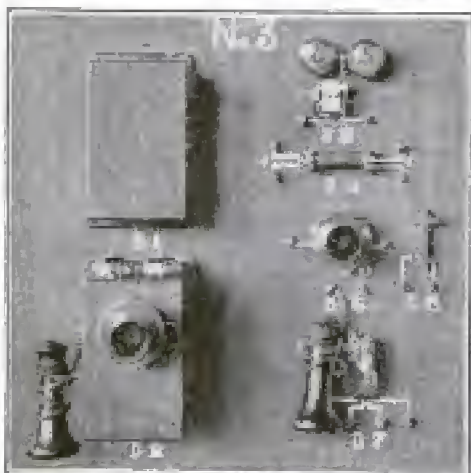
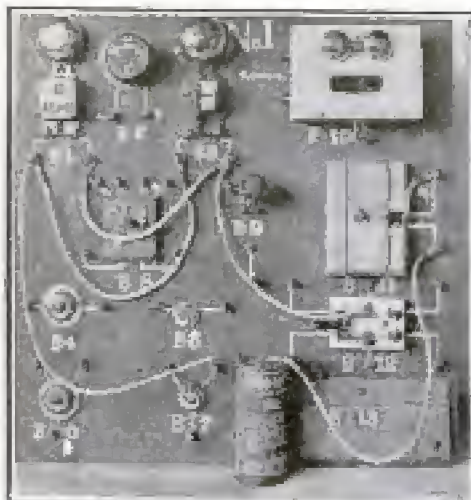
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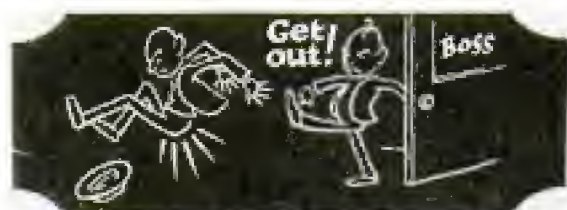
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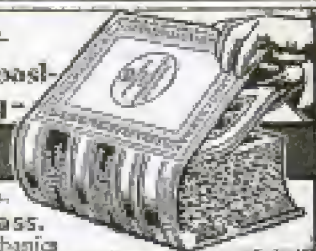
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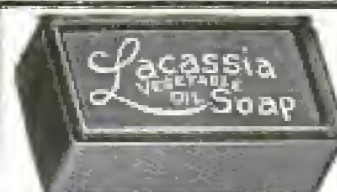
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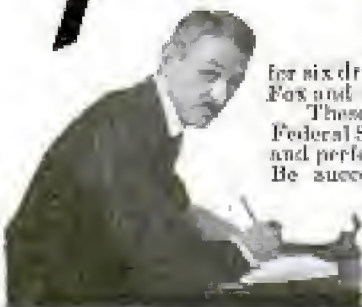


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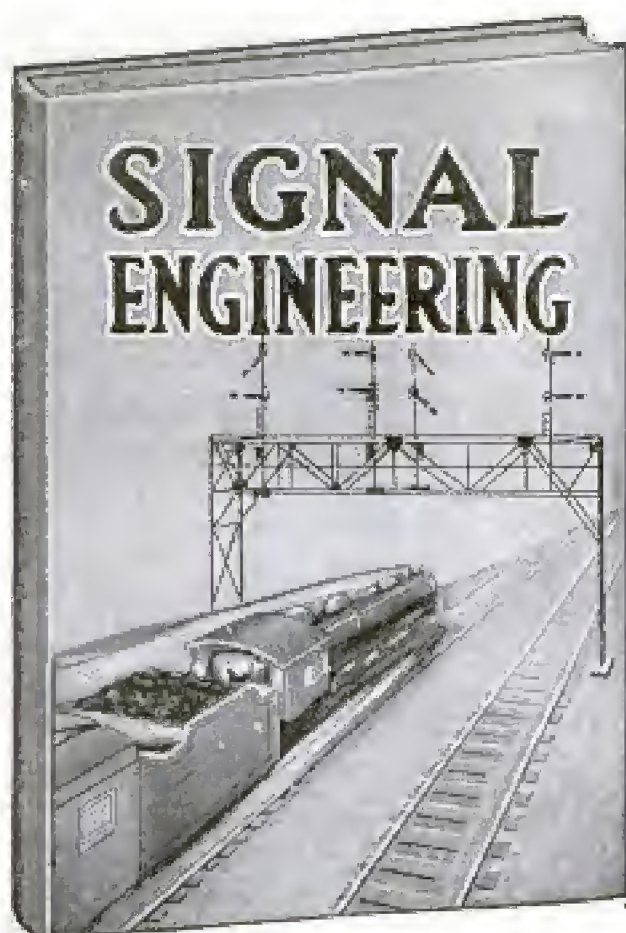


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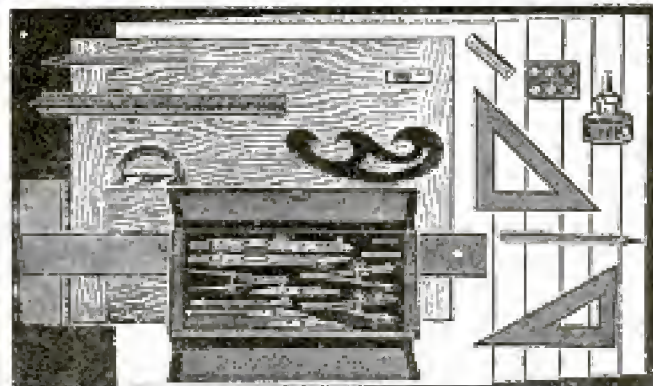
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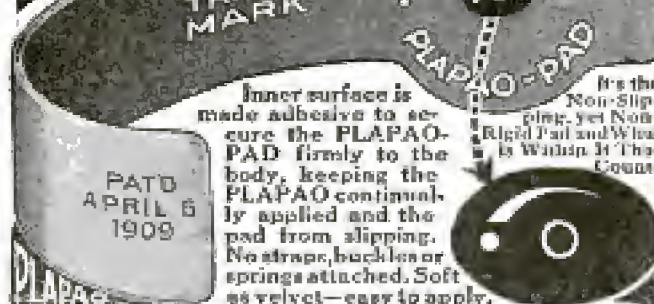
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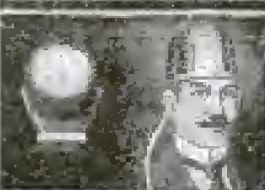
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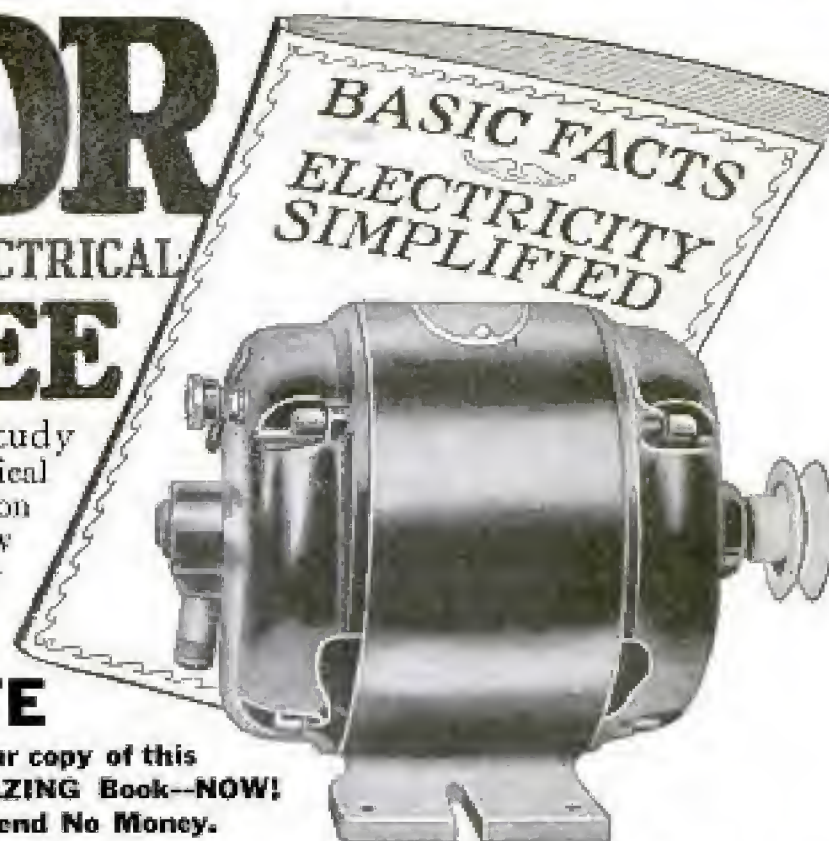
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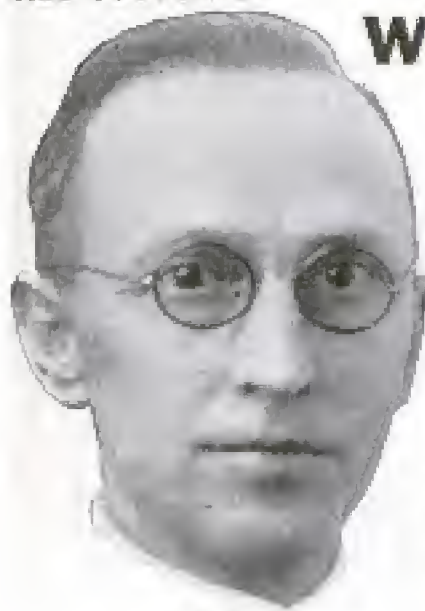


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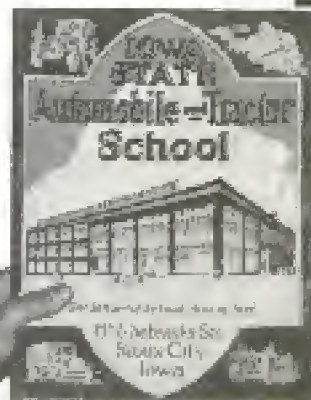
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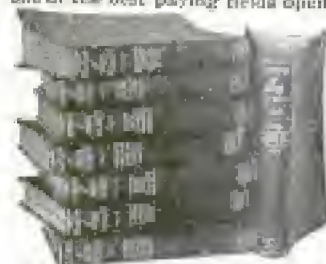
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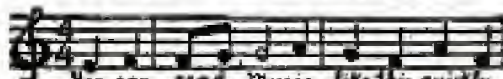


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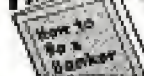
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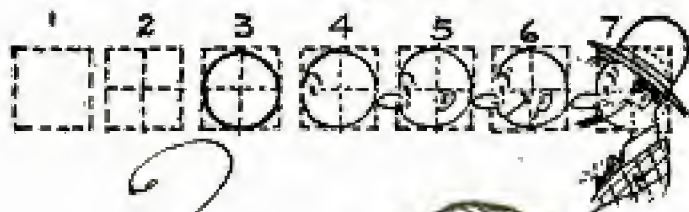
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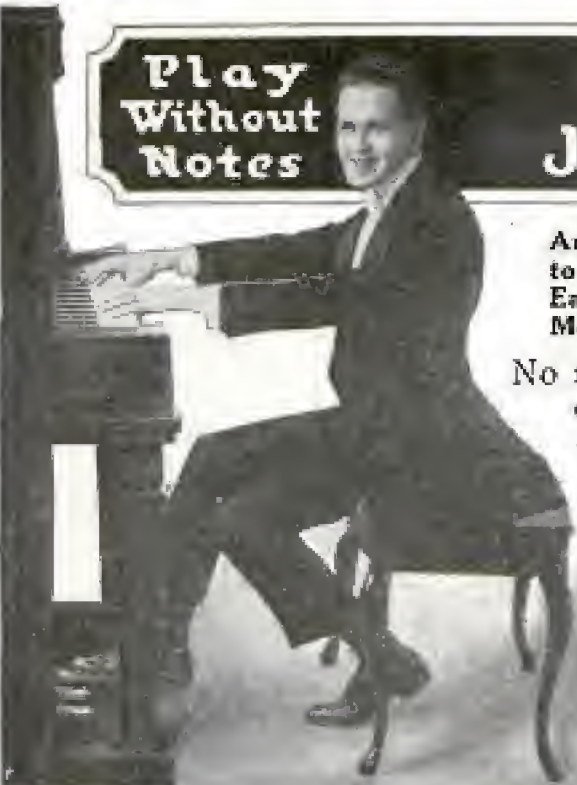
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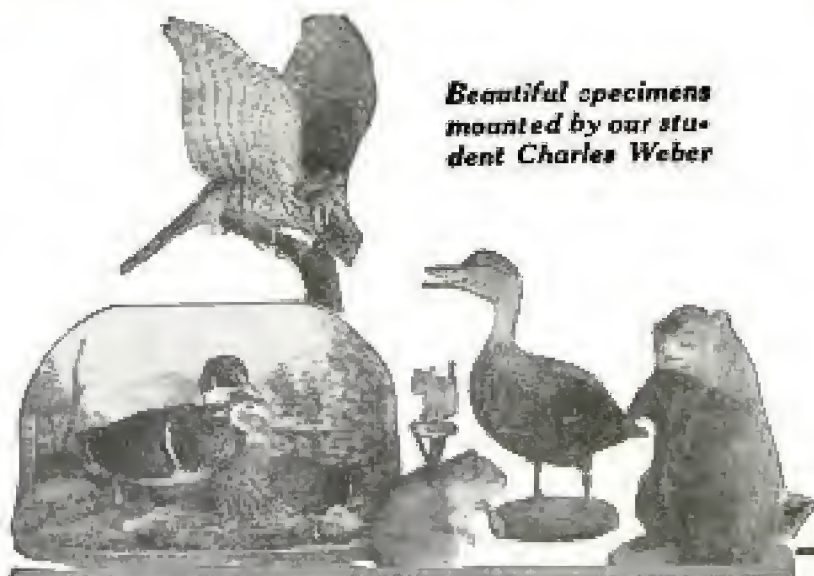


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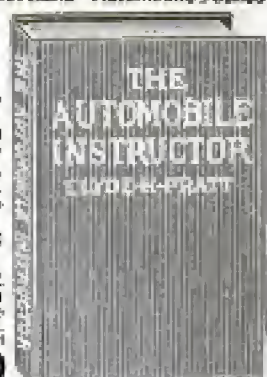
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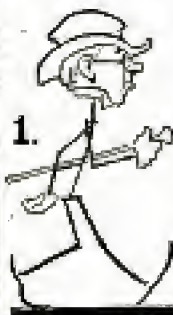
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"Young man," he said, "I have just received a letter from the International Correspondence Schools telling me you have enrolled and have received a mark of 93 for your first lesson."

"I don't mind saying that this letter has saved your job. I had you on the list of men to be dropped. But I'm going to keep you now. The man who thinks enough of his future to study his job is the kind of a man we want around here."

HOW about you? Are you sitting on the anxious bench wondering if you will be the next to go? Or are you training yourself so that you will not only be sure of your present job but will be ready for the job ahead?

No matter where you live, the I. C. S. will come to you. No matter how limited your previous education, the simply-written, wonderfully-illustrated I. C. S. textbooks make it easy to learn. No matter what career you may choose, some one of the 100 I. C. S. Courses will surely suit your needs.

This is all we ask: Without cost or obligation, put it up to us to prove how we can help you. Just mark and mail this coupon. Today is best.

TEAR OUT HERE

INTERNATIONAL CORRESPONDENCE SCHOOLS
BOX 1594-C SCRANTON, PA.

Without cost or obligation please explain how I can qualify for the position, or fit the subject before which I have marked an X in the list below:

☐ ELECTRICAL ENGINEER
Electric Lighting & Railways
Electric Wiring
Telephone Engineer
MECHANICAL ENGINEER
Mechanical Draftsman
Machine Shop Practice
Toolmaker
Gas Engine Operating
CIVIL ENGINEER
Surveying and Mapping
MINE FOREMAN or ENGR.
STATIONARY ENGINEER
Marine Engineer
ARCHITECT
Contractor and Builder
Architectural Draftsman
Concrete Builder
Structural Engineer
PLUMBING & HEATING
Sheet Metal Worker
Textile Overlooker or Supt.
CHEMIST
Pharmacy

☐ BUSINESS MANAGEMENT
SALESMANSHIP
ADVERTISING
Show Card & Sign Pkg.
Railroad Positions
ILLUSTRATING
Cartooning
Private Secretary
Business Correspondent
BOOKKEEPER
Stenographer & Typist
Certified Public Accountant
TRAFFIC MANAGER
Railway Accountant
Commercial Law
GOOD ENGLISH
Common School Subjects
CIVIL SERVICE
Railway Mail Clerk
AUTOMOBILES
Mathematics
Navigation
AGRICULTURE
Poultry Raising ☐ Spanish
BANKING ☐ Teacher

Name.....

Street and No.

City..... State.....

Occupation.....

If You Miss This Story You Are Out of Luck!

Good as all AMERICAN BOY stories are, we've got a new one starting in January that is a corker. "Advertising Andy," by Edward Edson Lee, is a series of stories of a boy who had an ambition bigger than driving a delivery wagon. As you read it you will learn there are worlds of fascinating things about advertising. You will understand how advertising keeps the chimneys of big factories smoking, puts merchandise onto dealers' shelves, and makes it easier for people to buy reliable goods. Through it all runs a chuckle from first to last.

Then, too, you must read "Noah's Bark," by Charles Tenney Jackson. It's a scream of a yarn about a "houn' dog" who hated water.

"Nobody's Fool," by K. P. Kempton, is a tale of a strangely matched pair in the radio shack of a big liner; Ike Palmer, haunted by the expectation of trouble, and Slim Giles, fresh from radio school. In this story they meet with a terrifying disaster at sea. It is immense!

AND ICE HOCKEY! Just how to play it is told (with diagrams) by Alfred Winsor, America's foremost college coach. "Every boy who wants to be a champion hockey player," he says, "should start young, skate and play shinny." Get in on this finest winter sport!

There's also an article about life insurance that will open your eyes. Tell your parents you want to read it—and want them to read it.

If you are not a regular subscriber to THE AMERICAN BOY you ought to be. A subscription insures you against missing any of the good stories coming. If you buy it each month you'd better stop in at your news-dealer's now and tell him to reserve the January number for you.

The subscription price is \$2.00 a year by mail—at news-stands it is 20c a copy



The American Boy

The Largest Circulation Boy Magazine
for Boys in All the World

THE SPRAGUE PUBLISHING CO.
No. 370 American Bldg., Detroit, Mich.

Herewith find \$2.00. Please send THE AMERICAN BOY for one year, beginning with the current issue, to

Name

Address

NAME	POSITION	SALARY
John	AUTOMOBILE ENGINEER	\$125 A WEEK
	REPAIR MAN	\$50 A WEEK
	CHAUFFEUR	\$40 A WEEK

Put Your Name On this Pay-Roll

Men like you are wanted for big-pay positions in the fascinating field of automobile engineering. We have made it easy for you to fit yourself for one of these positions. You don't have to go to school. You don't have to serve an apprenticeship. Fifteen automobile engineers and specialists have compiled a spare time reading course that will equip you to be an automobile expert without taking any time from your present work.

AUTO BOOKS 6 Volumes Shipped FREE

Now ready for you—at a big reduction in price—an up-to-the-minute six-volume library on Automobile Engineering, covering construction, care and repair of pleasure cars, motor trucks, tractors and motorcycles. Brimming over with advanced information on Lighting Systems, Garage Design and Equipment, Welding and other repair methods. Contains everything that a mechanic or an engineer or a motorcyclist or the owner or prospective owner of a motor car ought to know. Written in simple language that anybody can understand. Tastefully bound in flexible covers and gold stamped, 2700 pages and 2400 illustrations, tables and wiring diagrams. A library that cost thousands of dollars to compile but that comes to you free for 7 days' examination.

Only 10 Cents a Day

Not a cent to pay in advance. First you see the books in your own home or shop. Just mail coupon and pay express charges when books arrive. You can read them and study them for seven whole days before you decide whether you want to keep them or not. If you like the books send \$2.80 in seven days and \$3.00 a month until the special price of \$24.80 has been paid. (Regular price \$45.00.) Along with the set goes a year's membership in the American Technical Society, including consulting privileges and free employment service.

Send No Money Now

Don't take our word for it. See the books without cost. There is so much profit in this offer for you, that we urge you not to waste a moment in sending for the books. Put the coupon in the mails today. SEND NO MONEY—only the coupon.

American Technical Society

Dept. A-191

Chicago, Illinois

American Technical Society, Dept. A-191, Chicago

Please send me a set of Automobile Engineering books in 6 volumes by express collect, for a week's free use. At the end of a week I will either send the books back at your expense or send you \$2.80 as first payment and \$3.00 each month thereafter until a total of \$24.80 is paid. I understand that I will get a membership in your society, including consulting privileges and free employment service if I purchase the books.

Name

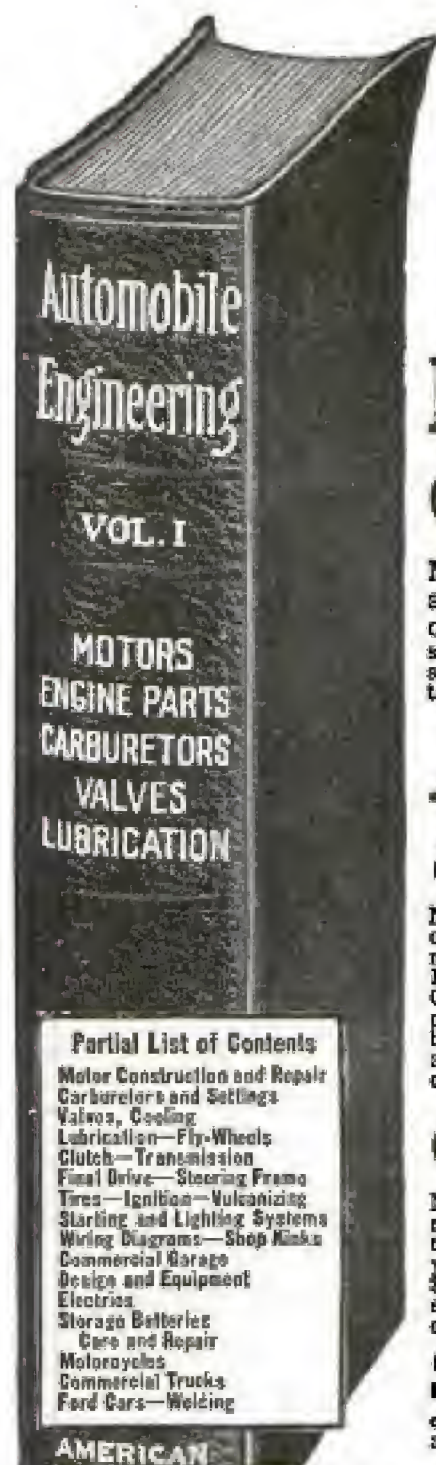
Address

City

State

Reference

Mail The
Coupon For
These Books



Partial List of Contents

Motor Construction and Repair
Carburetors and Settings
Valves, Cooling
Lubrication—Fly-Wheels
Clutch—Transmission
Final Drive—Steering Frame
Tires—Ignition—Vulcanizing
Starting and Lighting Systems
Wiring Diagrams—Shop Kinks
Commercial Garage
Design and Equipment
Electrics
Storage Batteries
Care and Repair
Motorcycles
Commercial Trucks
Ford Cars—Welding

AMERICAN





FREE

PROFESSIONAL TONE MUSICAL INSTRUMENTS

and lessons sent on **free** trial. Violin, Tenor Banjo, Hawaiian Guitar, Ukulele, Mandolin, Cornet, Banjo-Mandolin, Banjo-Ukulele, Guitar, Banjo-Guitar, or Banjo. Wonderful new copyrighted system of teaching note music by mail. Four lessons will teach you several pieces. Over 100,000 successful players. Do not miss this **free** trial offer. Write for booklet. No obligation.

SLINGERLAND SCHOOL OF MUSIC, INC., 1815 ORCHARD ST., DEPT. 104, CHICAGO, ILL.



Hotels Need Trained Executives

Nation-wide demand for trained men and women in all departments of hotels, clubs and apartment houses. Uncrowded field; fine living, quick advancement in the big hotels of the United States—now America's Fourth Largest Industry. Statistics show that **ONE IN EVERY TEN HOTELS WILL HAVE AN OPENING FOR A MANAGER THIS YEAR.** Thousands of other positions also open to those who qualify through training.

The Lewis School guarantees to give you the valuable knowledge that it has taken some of the most successful hotel men years to obtain—men who are now making \$5,000 to \$20,000 a year. All of your training will be under the personal direction of Clifford Lewis—a hotel expert of national reputation. A few spare-time hours a week given to the simple, clear lessons of the course will open the way to a good position, a fine living and a handsome salary. The training will in no way interfere with your present avocations.

Free Course
**LEWIS HOTEL
TRAINING SCHOOL**
Room 319
Washington, D. C.

Send no money obligation
the **FREE BOOK** "Your Big
Opportunity."

Send today for **FREE BOOK**, "Your Big Opportunity." Don't wait a minute—you may lose the opportunity of a lifetime. Mail the coupon **NOW.** Your whole future may depend on it. *Postdated 1916.*

**LEWIS HOTEL
TRAINING SCHOOL**
Clifford Lewis, Pres.
Room 319
Washington, D. C.

Name
Street
City State

\$95 to \$135 a Month

Men—boys—over 17—should write at once

Rapid advancement. "No Lay-offs." **THE POSITION IS YOURS FOR LIFE.**

Common-sense education sufficient. Political influence **NOT REQUIRED.**

Write immediately for schedule showing the places and dates of ALL COMING Government Examinations. Don't delay.

FRANKLIN INSTITUTE, Dept. T178, Rochester, N. Y.

LEARN The BUSINESS of Advertising



QUICKLY BY MAIL

We guarantee to teach you. It's **easy** to learn—and **easy** to get into! Make the start **this week.** This free book tells how.

\$75 to \$100 a Week

—frequently paid beginners. There is **no limit** to opportunities which men and women trained in advertising meet on every hand.

FREE This interesting book on advertising is sent free. Tells just the things you want to know about getting into this fascinating field. Full of facts.

PAGE-DAVIS SCHOOL, Dept. A12, Page Bldg., Chicago

WRITE NOW for Dyke's FREE Booklet



tells how you can learn at home—spare time—and **Become an Auto Expert** on repairing and electrical systems.



DYKE'S SCHOOL OF MOTORING, Box 300 Granite Bldg., St. Louis, Mo.
A department of the Fletch. Auto. Trk. Exch. Co. Original and only system of teaching. Endorsed by leading motor authorities of the world.

The WONDERFUL ERICKSON PATENT LEG

Will not chafe, overheat, nor draw end of stump.



ERICKSON ARTIFICIAL LIMB CO., 35 Wash. Av. N., Minneapolis, Minn.



Franklin Institute (The Parkway to Plenty), Dept. T178, Rochester, N. Y.
This coupon, filled out as directed, entitles the reader to free specimen questions a free copy of our book, "Government Positions and How to Get Them," a list of Government positions now open, and in consideration for free teaching for the examination here checked.

COUPON

..... Railway Mail Clerk (\$1400-\$2200) Postoffice Carrier (\$1400-\$1800)
..... Bookkeeper (\$1400-\$1800) Rural Mail Carrier (\$1200-\$2000)
..... Postoffice Clerk (\$1400-\$1800) Customs Positions (\$1100-\$2000)

Name

Address

Use this before you lose it. Write plainly.

Your Life May Be a Gold-Mine of Ideas for Stories and Photoplays

DOESN'T YOUR life have its stories of love, its trials, joys, surprises, partings, misunderstandings, and reconciliations? Doesn't EVERY life have its stories—and its photoplays? Don't all of us take part daily in plots and situations of comedy and tragedy? Isn't life a succession of changes, of variations, of new experiences seen, heard, taken part in?

And the stories you read, the plays you see, any one of them might well be stories of your own life changed around a bit to bring out a certain effect. "But," you say, "no one would be interested in me or my life." Right there is where you might be doing yourself a grave injustice. Just think of the countless stories starring heroes or heroines of every-day life—housewives, stenographers, mechanics, teachers, doctors, lawyers, and men and women of all stations. Every occupation has been written of and excellent story and play material made from each. Would it not be splendid to see some story of your own life amusing, thrilling, and uplifting readers and theater-goers all over the world?

The dashing buccaner, the wild-west hero, the blood-thirsty villain, and other exaggerated, impossible characters play an extremely small part in the fiction of to-day. Small town and country folk are being featured more and more, as witness the rubic roles of Charles Ray, and Sinclair Lewis's "Main Street."

So, you see, every section of the country, no matter how small or insignificant, every person, regardless of position or education, has a story, a place in the pages of our imaginations and on the screens of our movie theaters.

Every day new writers spring up. Are they any different from you? The old superstition that writers were magically endowed has thankfully gone the way of so many old-fashioned and hateful prejudices. People now realize that a story is nothing more or less than a snap-shot of some particular phase of life, some incident, some character, idea, or setting. The happenings and persons making up a plot may be fictitious, but they must be true to the elemental impulses of life nevertheless.

Writing, then, has become an ordinary occupation stripped of all its fearful aspects. So many things we do not quite understand become quite simple when they are explained.

The most surprising part of it all is that editors seem

KIND OF PROOF YOU LIKE TO SEE

"There never has been such a market for good fiction as there is to-day. This is the golden age for writers. Any man or woman with an original idea or even an original way of handling an old idea, can sell their manuscript as fast as they can turn them out."—ROBERT H. DAVIES, of Munsey's Magazine.

"It requires no literary experience or ability."—MARGARET FAIRBAX, writer for Story Pickford.

"In every man and every woman there is some great moving picture scenario. There is material for screen masterpieces in the life of the dullest person you meet on the street to-day. Your neighbors are living stories that, if told nobly and spiritedly, would touch and thrill the world."—D. W. GRIFFITH, producer of "Birth of a Nation," "Way Down East," "Intolerance."

"Original screen plays by unknown authors sell for from \$500.00 to \$5,000.00."—JOHN ESTERHON, well-known photo playwright.

"The best reading matter is no frequently obtained from absolutely new writers as it is from famous writers."—JOHN N. STODALL, Editor of American Magazine.



Photo © by Emma L. A.

Miss Claire Windsor, famous film star.

Read her inspiring message in "The Wonder Book for Writers" sent free to anyone.

since even a gleam of genius is hailed with acclaim. It is safe to say that any well-conceived story, no matter how obscure may be the author, will not pass three editors for whom it is available before it is snapped up." AND HUNDREDS OF OTHER EDITORS HAVE MADE LIKE STATEMENTS!

People are curious by nature. They are always looking about to see what the other fellow is doing, saying, discovering. A man in Cuira is just as interested in you and your mode of living as you are in him and his circumstances. City dwellers go to the country and read stories of country life, while country and small town dwellers do the reverse. A person's interest is piqued by something that is not his. And since we are all different from each other, every person is a source of wonder to every other person.

And that is why YOUR life has its stories and photoplays which the public is so anxiously waiting to read.

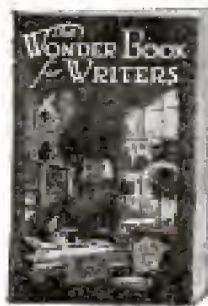
There is a new book awaiting you that amazes every reader—and the most amazing thing of all is—IT'S FREE! Within its covers are surprises and revelations for doubting beginners that have caused a sensation everywhere, because it is crowded with THINGS THAT GRATIFY YOUR EXPECTATIONS—good news that is dear to the heart of all those aspiring to write; stories of success, brilliant instances of literary fame coming unexpectedly; new hope, encouragement, helps, hints—things you've long wanted to know!

"THE WONDER BOOK FOR WRITERS" tells how stories and plays are conceived, written, perfected, sold. How both men and women, young and old, suddenly realize they can write.

after years of doubt and indecision. How the scenario and story writers began. How they quickly rose to fame and fortune. How simple plots and ordinary incidents become thrilling stories and plays through New Easy Methods that simplify everything! How one's imagination may bring glory and greatness. How to really test your natural writing ability. How stories and plays are built up step by step. How to turn Uncertainty into Success.

This book and all its secrets are YOURS! You may have a copy absolutely free. You need not send a penny. You need not feel obligated. You need not hesitate for ANY reason. The book will be mailed to you without any charge whatever.

There is no need to let your laudable ambition stand still—no need to starve the Noble Flame that burns at the Altar of your Dearest Hope—no need to wait, to wish—to merely dream of being a writer. Your brilliant opportunity, your golden chance, is HERE AND NOW! Get your pencil—use the coupon below. This little act may prove the big, lucky stroke of your destiny.



THE AUTHORS' PRESS,

Dept. 127, Auburn, N. Y.

Send me ABSOLUTELY FREE, "The Wonder Book for Writers." This does not obligate me in any way.

Name.....

Address.....

City and State.....

Another famous editor makes the startling statement:

"Every editor of every magazine and studio in the United States is searching for good material. Readers in the employ of the various companies are delving hungrily, eye ravenously, for new writers, and the appear-

Gibson Instruments

Mandolin, Mandola, Mando-Cello,
Guitar, Tenor-Banjo, Mandolin-
Banjo, Cello-Banjo, Guitar-
Banjo, Harp-Guitar,
Mando-Bass —



**Easy to Play
Easy to Pay**

Select your Gibson now. You can soon be playing the music of the day. Your friends will be surprised and delightfully entertained. Let us help you organize a Gibson Orchestra in your community. You can increase your popularity, income and pleasure by playing for Concoits, Entertainments, Church Affairs, etc. A small down payment and then \$5 a month will soon pay for a Gibson and will furnish you with wholesome, year-round entertainment. If you have an old instrument, we will make liberal allowance on a Gibson. Write for Free Book, Catalog, Free Trial Offer, information about Wm. Price, Jr. Book and Instrument Company.

GIBSON MANDOLIN-GUITAR COMPANY
1281 Parsons Street Kalamazoo, Mich., U. S. A.



MAKE MONEY Make Show Cards and Signs

EARN \$10.00 to \$25.00 DAILY as salary or have own shop and independence. Easy to learn. BIG DEMAND. Complete course in 50 lessons with individual correspondence instruction. Including hand lettered show cards and 275 patterns MILLERINE COLORS and 12 BRUSHES FREE. WRITE TODAY for special offer, illustrated prospectus, price and terms. Students established in paying sign shops by our unique money-making plan in 90 days time.

EMPIRE W. INSTITUTE OF LETTERING, 2350 Amsterdam Ave., N. Y.

10 Buys
\$100
Millions
Billions
In one
year



Engel
"Art Corners"

No Paste, Needles
Use them to mount all kodak
pictures, post cards, clippings in albums

Made in Square, Round, Oval, Fancy and Heart
of black, gray, red, and 100 colored paper.
Big loop on corners of pictures, then use and stick.
QUICK-EASY-ARTISTIC. No fuss, no fuss. At whole
supply, drug and stationery stores. Accept no substitutes.
There is nothing as good. 70¢ brings full pkg. and samples
from Engel Mfg. Co. Dept. 4-A 4711 N. Clark St. CHICAGO



DRAW A BIG SALARY

as Mechanical or Architectural Draftsman

Why plod along at distasteful, hard and low-waged work, when we can qualify you in spare time at home to earn big pay in this easy, fascinating profession. Drafting is the language of construction—the open door to progress and success in

engineering and architecture. Latest, greatest, easiest course. Famous Foster System originated by our President, the founder of mail instruction, who has made thousands of draftsmen, engineers and architects out of clerks, mechanics and salesmen. Drawing Booklet and sample physical too.

Address, Dept. E-134 INDUSTRIAL CORRESPONDENCE UNIVERSITY, Inc. 1504 Locust Street, Philadelphia, Pa.

TIRES BEST VALUES EVER OFFERED

32x4-\$9. 33x4-\$9.50. 34x4-\$10.50
Used tires. Other sizes just as low. Cards and fabrics. Send no money. Return tires if not satisfactory when received. State if you want a.s. or cl. Supply limited at this price. Order quick.
ROYAL TIRE & SUPPLY CO., 1401 MICHIGAN AVE., DEPT. P, CHICAGO, ILL.

From \$30 to \$1000 per Week!

That is the record of one man who read and applied the lessons in "Power of Will." Examine this great book free. Send no money. Pay \$3.00 after 5 days or return book. Address Felton Publishing Company, 12-A, Wilcox Block, Meriden, Conn.

Thousands of Positions
Waiting

Intensely Interesting
Work

BE A TRAFFIC MAN

Economical distribution is the problem confronting most concerns today in every part of the country. Only the man trained in Traffic Management has the solution to their problems. One of our students saved his concern \$80,000.00 in a single year. Many of them have saved their entire year's salary in the first month. Is it any wonder that the Traffic Manager's salary is large? The results of his work are always evident and he naturally demands a large salary.

You Can Command Salary of \$3,500.00 to \$10,000.00 Yearly

TRAINING is the difference between your job and that of the highly paid Traffic Manager. The field is unswayed, with thousands of positions open to trained men, but you must study, prepare. You can't win by wishing. "The good things of life don't come that way. The test of a man's success is his willingness to 'dig' for it. Prepare yourself now for this big job. Send us once for free booklet 'Traffic' and other information on this interesting unswayed field.

Pleasant Work--Easy to Learn

Spare time study—a few hours each week will soon fit you for one of these fine positions. Our course is highly practical. Entire course is given by practical, experienced traffic men, whose advice comes from their daily experience. Each student gets personal attention. Practical assistance rendered for two years after graduation.

Post Graduate Course Free

Graduates are privileged to use this feature without extra charge. Gives actual experience at our school in rates, routing, classification and packing—an exclusive feature not offered elsewhere.

We Give You a Job at Once Earn While You Learn

We have just perfected an entirely new plan. To students who so desire, we can give a position whereby they can earn while they learn. This is an opportunity to make money that can be used to pay your tuition. The hustler can do even better. It is Traffic work, practical training every graduate needs. It is easy to do, needs no previous experience or training, can be done in spare time and helps the student in his study. This "student earning plan" is an exclusive Interstate Traffic School feature. Think of it! You begin to earn almost as soon as you enroll. This feature together with our Post Graduate Course takes in proven at our school, makes our graduates finished business men as well as thorough Traffic men.

If You Are Out of Work

Don't ever be out of work again. Let this "hard time" be your last "hard time." Get into a business of your own—into a profession with no idle seasons of "hard time" lay-offs. Remember! you begin earning money soon after enrolling. You learn in an hour or two how to make money this new, exclusive Interstate Traffic School way. It is the greatest and most practical feature ever given by any correspondence or residence school.

Prove your ambition.
Mail Coupon TODAY for
Full Information.

INTERSTATE TRAFFIC SCHOOL, 21 Traffic Bldg., Fort Wayne, Indiana

TRANSPORTATION
INTERSTATE COMMERCE

Clip, Sign and Mail

Interstate Traffic School
21 Traffic Bldg.,
Fort Wayne, Indiana.

Gentlemen: Without obligation,
please send me booklet "Traffic"
and full information about the job
you can give me.

Name

Address

City State

Present Occupation

DO YOU WANT \$200 A WEEK?

The Amazing Story of How Carl A. Rowe Jumped from \$200 to \$1000 a Month

My name is Rowe—Carl Rowe. I live in a small city in New York State.

I am going to tell you an amazing story about myself. It may seem too strange to believe, but you can easily verify everything I have to say.

Two years ago I was a baker. I was struggling along, trying to make the money in my pay envelope meet the increasing expenses of our family. There was no prospect for the future.

Today, just two years later, I am a successful business man. I have plenty of money for all the things we need and want. Last month I made \$876 during my spare time, and was able to put \$200 a week in my savings account.

I am going to tell you how it happened.

Please remember that two years ago I had no surplus cash. I was in the same fix as nine out of ten other men. Expenses were constantly mounting and my salary, although it had increased, could not keep pace with the cost of living. My wife had to do without things that I knew she ought to have. We wanted an automobile, but we couldn't afford it. We wanted to buy our own home, but couldn't afford that.

It made me desperate to think of what might happen if I became sick or lost my job. I worried about it, and so did my wife. We were living from hand to mouth, and we didn't know what calamity and hardships might be lurking just around the corner.

And yet—today—I own our nine-room house. I have an automobile. I have money for books, the theater, or any other pleasures that I may want. I have the cash today to educate my son and send him through college.

Here is how it happened. One day in glancing through a magazine I read an advertisement. The advertisement said that any man could make from a hundred to three hundred dollars a month during his spare time.

I didn't believe it. I knew that I worked hard eight hours a day for \$50 a week, and I figured that no man could make that much during a couple of hours a day spare time.

But as I read that ad I found that it pointed to men who had made that much and more. In the last paragraph the advertiser offered to send a book without cost. I still doubted. But I thought it was worth a two-cent stamp, so I tore out the coupon and put it in my pocket, and the next day on my way home from work I mailed it.

When I look back to that day and realize how close I came to passing up that ad, it sends cold chills down my spine. If the book had cost me a thousand dollars instead of a two-cent stamp, it would still have been cheap. All that I have today—an automobile, my home, an established business, a contented family—all these are due to the things I learned by reading that little eight-page booklet.

There is no secret to my success. I have succeeded, beyond any dream I may have had three years ago, and I consider myself an average man. I believe that I would be criminally selfish if I did not tell other people how I made my success.

All the work I have done has been pleasant and easy, and without amazingly simple, I am the representative in this territory for a raincoat manufacturer. The booklet that I read was one issued by that company.

It tells any man or woman just what it told me. It offers to anyone the same opportunity that was offered to me. It will give to anyone the same success that it has brought to me.

The Comer Manufacturing Company is one of the largest manufacturers of high-grade raincoats on the market; but they do not sell through stores. They sell their coats through local representatives. The local representative does not have to buy a stock—he does not have to invest any money. All he does is take orders from Comer customers and he gets his profit the same day the order is taken. Fully half of my customers come to my house to give me their orders.

My business is growing bigger every month. I don't know how great it will grow, but there are very few business men in this city whose net profit is greater than mine, and I can see only unlimited opportunity in the future.

* * *

If you are interested in increasing your income from \$100 to \$1,000 a month and can devote all your time or only an hour or so a day to this same proposition in your territory, write The Comer Manufacturing Company at Dayton, Ohio. Simply sign the attached coupon and they will send you the eight-page booklet referred to by Mr. Rowe and full details of their remarkable proposition.

CARL A. ROWE

facturing Company at Dayton, Ohio. Simply sign the attached coupon and they will send you the eight-page booklet referred to by Mr. Rowe and full details of their remarkable proposition.

-----Cut Out and Mail-----

The Comer Mfg. Co., Dept. W-53, Dayton, Ohio.

Gentlemen: Please send me, without obligation on my part, copy of your booklet and full details of your proposition.

Name.....

Address.....



“There’s One Man We’re Going to Keep”

“Ed Wilson, there, is one of the most ambitious men in the plant. I notice that he never fools away his spare time. He studies his International Correspondence Schools Course every chance he gets.

“It’s been the making of him, too. He hasn’t been here nearly so long as Tom Downey, who was laid off yesterday, but he knows ten times as much about this business.

“I’m going to give him Tom’s job at a raise in salary. He’s the kind of man we want around here.”

HOW do you stand in your shop or office? Are you an Ed Wilson or a Tom Downey? Are you going up? Or down?

No matter where you live, the International Correspondence Schools will come to you. No matter what your handicaps or how small your means, we have a plan to meet your circumstances. No matter how limited your previous education, the simply-written, wonderfully-illustrated I. C. S. text-books make it easy to learn.

This is all we ask: Without cost, without obligating yourself in any way, put it up to us to prove how we can help you. Just mark and mail this coupon.

TEAR OUT HERE

INTERNATIONAL CORRESPONDENCE SCHOOLS
BOX 5595-C SCRANTON, PA.

Without cost or obligation please explain how I can qualify for the position, or in the subject below which I have marked an X in the list below:

☐ **ELECTRICAL ENGINEER**
Electric Lighting & Railways
Electric Wiring
Telegraph Engineer
Telephone Work
☐ **MECHANICAL ENGINEER**
Mechanical Draftsman
Machine Shop Practice
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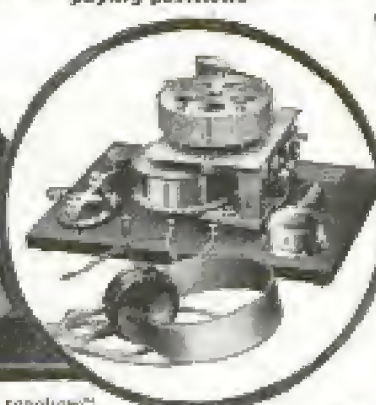
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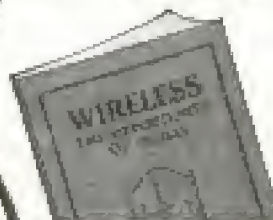
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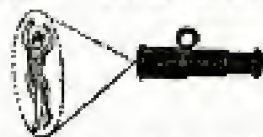


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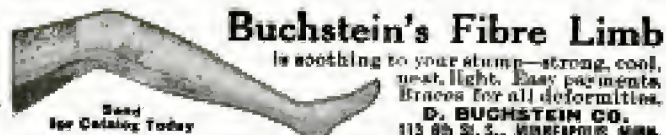


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In auto factories; branches, service shops; where tractors are made; in airplane work; with motorcycle and speed boat makers; around lighting-plant shops; you can practically pick your job, or own your own repair shop. And there is an easy way to get experience you need.

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form auto lights to the regulations. Start now.

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You can master this profitable line in three months! Not by digging it out of books; not by a long distance correspondence course, but *where the work is being done*. In your overalls. Doing it *yourself*. At the shops where 800 trained experts were turned out last year.

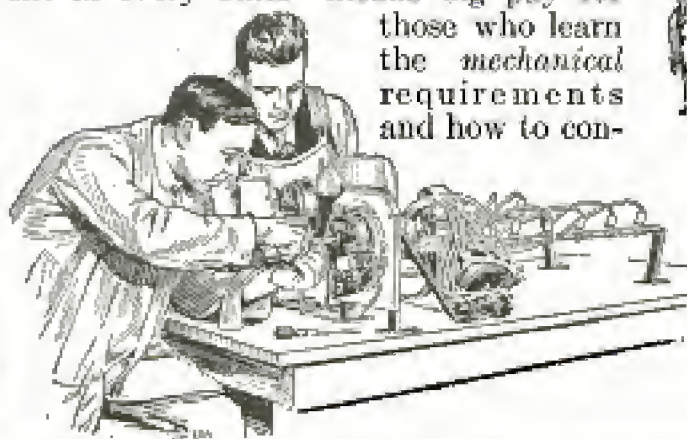
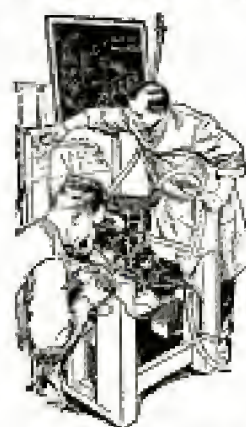
You will then know what a "trouble-shooter," inspector, foreman must know. The mysteries of the "electric line" will be an open book.

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What's Wrong in this Picture?

It's so easy to make embarrassing mistakes in public—so easy to commit blunders that make people misjudge you. Can you find the mistake or mistakes that are being made in this picture? Can you point out what is wrong? If you are not sure, read the interesting article below, and perhaps you will be able to find out.

IT is a mark of extreme good breeding and culture to be able to do at all times exactly what is correct. This is especially true in public where strangers judge us by what we do and say. The existence of fixed rules of etiquette makes it easy for people to know whether we are making mistakes or whether we are doing the thing that is absolutely correct and cultured. They are quick to judge—and quick to condemn. It depends entirely upon our knowledge of the important little rules of etiquette whether they respect and admire us, or receive an entirely wrong and prejudiced impression.

In public, many little questions of good conduct arise. By public, we mean at the theatre, in the street, on the train, in the restaurant and hotel—wherever men and women who are strangers mingle together and judge one another by action and speech. It is not enough to *know* that one is well-bred. One must see that the strangers one meets every day get no impression to the contrary.

Do you know the little rules of good conduct that divide the cultured from the uncultured, that serve as a barrier to keep the ill-bred out of the circles where they would be awkward and embarrassed? Do you know the important rules of etiquette that men of good society must observe, that women of good society are expected to follow

rigidly? Perhaps the following questions will help you find out just how much you know about etiquette.

Etiquette at the Theatre

When a man and woman walk down the theatre aisle together, should the man precede the woman? May they walk arm-in-arm? When the usher indicates their places, should the woman enter first or the man?

Many puzzling questions of conduct confront the members of a theatre party who occupy a box. Which seats should the women take and which the men? Should the women remove their hats—or don't they wear any? What should women wear to the theatre in the evening? What should men wear? Is it correct for a man to leave a woman alone during intermission?

At the theatre, evidences of good conduct can be more strikingly portrayed than perhaps anywhere else. Here, with people surrounding us on all sides, we are admired as being cultured, well-poised and attractive, or we are looked upon as coarse and ill-bred. It depends entirely upon how well one knows and follows the rules of etiquette.

At the Dance

How should the man ask a woman to dance? What should he say to her when the music

ceases and he must return to his original partner? Do you know the correct dancing positions?

How should a woman accept a dance and how should she refuse it? How can the embarrassment of being a wall-flower be avoided? How many times may a girl dance with the same partner without breaking the rules of etiquette? Is it considered correct, in social circles, for a young woman to wander away from the ball-room with her partner?

Very often introductions must be made in the ball-room. Should a man be introduced to a woman, or a woman to a man? Is it correct to say, *Miss Brown, meet Mr. Smith* or *Mr. Smith, meet Miss Brown*? Which of these two forms is correct: *Bobby, this is Mrs. Smith*, or *Mrs. Smith, this is Bobby*? When introducing a married woman and a single woman should you say, *Mrs. Brown, allow me to present Miss Smith*, or *Miss Smith, allow me to present Mrs. Brown*?

When leaving the ball-room, is the guest expected to thank the hostess? What should the woman guest say when she leaves? What should the gentleman guest say? It is only by knowing exactly what is correct, that one can avoid the embarrassment and humiliation of social blunders, and win the respect and admiration of those with whom one comes into contact.

In the Street

There are countless tests of good manners that distinguish the well-bred in public. For instance, the man must know exactly what is correct when he is walking with a young woman. According to etiquette, is it ever permissible for a man to take a woman's arm? May a woman take a gentleman's arm? When walking with two women, should a man take his place between them or on the outside?

When is it permissible for a man to pay a woman's fare on the street-car or railroad? Who enters the car first, the woman or the man? Who leaves the car first?

If a man and woman who have met only once before encounter each other in the street, who should make the first sign of recognition? Is the woman expected to smile and nod before the gentleman raises his hat? On what occasions should the hat be raised?

People of culture can be recognized at once. They know exactly what to do and say on every occasion, and because they know that they are doing absolutely what is correct, they are calm, well-poised, dignified. They are able to mingle with the most highly cultivated people, in the highest social circles, and yet be entirely at ease.

The Book of Etiquette

There have probably been times when you suffered embarrassment because you did not know exactly what to do or say. There have probably been times when you wished you had some definite information regarding certain problems of conduct, when you wondered how you could have avoided a certain blunder.

The Book of Etiquette is recognized as one of the most dependable and reliable authorities on the conduct of good society. It has solved the problems of thousands of men and women. It has shown them how to be well-poised and at ease even among the most brilliant celebrities. It has shown them how to meet embarrassing moments with a calm dignity. It has made it possible for them to do and say and write and wear at all times only what is entirely correct.

In the Book of Etiquette, now published in two large volumes, you will find chapters on dinner etiquette and dance etiquette, chapters on the etiquette of engagements and weddings, chapters on teas and parties and entertainments of all kinds. You will find authoritative information regarding the wording of invitations, visiting cards and all social correspondence. The subject of introductions is covered exhaustively, and the etiquette of travel devolves into an interesting discussion of correct form in France, England and other foreign countries. From cover to cover, each book is filled with interesting and extremely valuable information.

Do You Know—

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- How* to greet a man or woman acquaintance in public?
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- How* to use table silver properly?
- How* to word invitations and acknowledgments?
- How* to avoid blunders at the theatre and opera?
- How* to do at all times the thing that is absolutely correct and cultured?

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Let us send you the famous Book of Etiquette free so that you can read and examine it in your own home. You are not obligated to buy if you do not want to. Just examine the books carefully, read a page here and there, glance at the illustrations, let it solve some of the puzzling questions of conduct that you have been wondering about. Within the 5 days, decide for yourself whether or not you want to return it.

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How Cubberley Tripled His Salary

BY EUGENE FITZGERALD

The true story of a country boy's rise to industrial engineer with E. I. du Pont de Nemours Company



TAKE out your map or atlas and turn to the State of Missouri. Start at Jefferson City and run your finger northwest past Brunswick, Chillicothe and Gallatin until you come to the small dot that stands for Pattonsburg.

You may hardly be able to find it, for Pattonsburg is a town of only 900 inhabitants. But this unobtrusive little town was the home of A. H. Cubberley, now industrial engineer with the E. I. du Pont de Nemours Company, of Wilmington, Delaware.

When Mr. Cubberley was fifteen years old he was employed as an assistant clerk in a small hardware store at a salary as small as the position.

Fortunately, Cubberley was not satisfied. He saw that there was no future in the work he was doing, and he decided to make a new start before it was too late.

But what should he do and how should he do it? That was the question. How was he to get the special training which he knew he needed so badly?

Sometimes he would stay awake for hours thinking about it—wondering about it—yes, worrying about it.

And then one day he found the answer!

He was reading over a magazine, just as you are doing today, when he came across an advertisement of the International Correspondence Schools. He had seen many such advertisements before and had passed them by.

But somehow this particular advertisement told of a man just like himself who had won advancement and more money through spare-time study.

The story was so real—so convincing—that Cubberley decided he could do as well. So that day he marked and mailed that familiar coupon.

It was the turn in the road for Cubberley. He studied in the spare time that he used to waste. Those practical, well-illustrated I. C. S. textbooks fascinated him. They made everything so simple—so easy to learn.

And Cubberley felt himself growing—he found that concentration on his studies and a burning zeal to conquer new fields brought greater success than any other investment he had ever made.

Today, A. H. Cubberley, who was once an assistant clerk in a small country store, is an industrial engineer for the biggest company of its kind in the world—at a salary in keeping with the position.

"I attribute much of my success to the I. C. S.," he said to me the other day. "The training I got from those textbooks was the means of changing my entire life.

"And how easy it all was! I had just as much fun as the other fellows, but instead of wasting my spare time, I put it to work for me.

"Lots of fellows laughed at me and said I was just wasting my money. Many of them are still working at small jobs and small salaries.

"My advice to young men can be summed up in one word—*Study*. It is the only thing that will make you better than the other man. The I. C. S. advanced me from a mere worker to a trained man. It will do the same for every other man with ambition."

Employers are begging for men like Cubberley—men who really want to get ahead in the world and are willing to prove it by training themselves in spare time to do some one thing well.

Prove that you are that kind of a man! The International Correspondence Schools are ready and anxious to help you prepare for something better if you'll simply give them the chance. More than two million men and women in the last 30 years have taken the I. C. S. route to better jobs and more money.

Is there any reason why you should let others climb over you when you have the same chance they have? Surely, the least you can do is to find out just what there is in this proposition for you. Here is all we ask: Without cost, without obligating yourself in any way, simply mark and mail this coupon. Then, without cost or obligation, we will send you the full story of what the I. C. S. can do for you.

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P. 1-25

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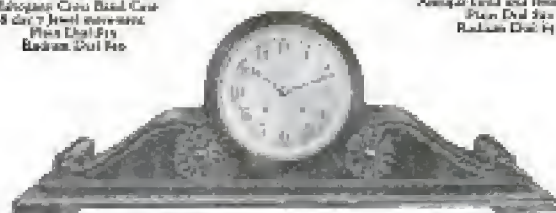
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Vol. 37

JANUARY, 1922

No. 1

7445 Mfr. B. S. A. Lewis, Ltd. Birmingham
Life-Line Gun Fired from Shoulder

GUNS for throwing life lines, used along the seacoast, have all been of the cannon type, but an English concern is now turning out a light line-throwing gun which is portable and can be fired from the shoulder. Though primarily designed for throwing life lines, it can also be used for mooring lines or, on land, for throwing lines to windows in case of fire. The line is contained in a cylinder which is slipped over the gun barrel

and held by a catch. A projectile is then attached to the line and dropped into the barrel and a cartridge inserted in the breech chamber. Ready to fire, the total weight is 14 $\frac{3}{4}$ lb. The recoil is about the same as that of a shotgun. A plumb-like bob on the rear sight indicates the elevation. At 30° a $\frac{1}{16}$ -in. line can be thrown 180 yd., or a $\frac{3}{16}$ -in. line 110 yd. When mounted on a base, the gun gives an even greater range.



The Portable Line-Throwing Gun in Use: No Matter Where It is Needed, It Quickly Meets the Emergency, For It Requires No Permanent Base or Other Preparation. The Box Contains Extra Cylinders of Line, Projectiles, and Cartridges, Complete Equipment for Every Need

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POPULAR MECHANICS

7439 ANTISKID WHEELS USED ON GERMAN MOTORCYCLE

As an antiskid arrangement, side wheels are placed on a motorcycle recently displayed at a Berlin auto show.



The Antiskid Motorcycle with a Body Built on It, in the Act of Making a Turn: The Small Wheel to the Right is Seen Touching the Pavement, Thus Preventing a Fall or Skidding

Each side wheel is arranged at such an angle from the body as to prevent the machine from skidding or falling over when turning in either direction. These wheels also support the motorcycle when not in use. A body, similar to that of the ordinary sidecar, is built around the framework of the vehicle, and the driver rides as in a small automobile.

No record maker or inventor - shown at Berlin Auto Show.

3699

EXTRA BONES MISTAKEN FOR BROKEN ONES

People are like fish in that some of them have more bones than others. There are about half a dozen extra bones which occur in normal wrists and ankles, and several others are found more infrequently. Some of them may be explained by comparative anatomy. For instance, one extra bone that now and then occurs in the wrist is a regular bone in the corresponding part of lower animals right up to the monkey. They serve no useful

purpose; they are merely one of nature's distinctions, not one of her blessings. These surplus bones have a curious practical interest. It has just lately become generally realized that some of these extra bones, in X-ray photographs, resemble closely some of the ordinary fractures which result from personal injuries, and unless care is taken, wrong testimony will be given in court in damage suits. Fortunately, when these extra bones are present in one wrist or ankle they are usually in the other also, so that it is possible to identify them by taking X-ray pictures of the undamaged member.

7586

JAPANESE WOMEN'S PEACE PLAN THREE HUNDRED FEET LONG

If length counts for anything, the Japanese women have made a good start toward solving the world-wide problem of how to end all wars. The result of their efforts is a peace plan which is 300 ft. long, and is signed by 10,000 of their number. The document, which is written on rice paper, and has the signatures appearing both in English and Japanese script, was recently presented to the president at Washington, D. C. The committee which brought the interesting document was headed by a woman of 90 years.



Madame Kaji Yajima Holding the 300-Foot Peace Plan Signed by 10,000 Japanese Women and Presented to President Harding

cont C.A. Briggs
 1521 Oak St N.W.
 Washington, D.C.

229 W. 43rd St.
 New York City

Copyrighted material

Radio Constructed by: J. S. White
Engineering Corporation of N. Y.
WIRELESS INCIDENTS AROUSE WORLD INTEREST
43 Exchange Place



SIX of the 72 gigantic towers of the world's largest wireless station at Port Jefferson, L. I., which was formally opened by President Harding on Nov. 5, 1921, are shown here. The station, which was described by this magazine in the September 1920 issue, is operated entirely by remote-control apparatus from New York City—70 miles distant. Insert shows an artist giving a piano recital by wireless, said to be the first of this kind ever given, and estimated to have been heard by 35,000 persons between Maine and Texas.

7692

7692

CHINESE RAILWAY BUYS LARGE AMERICAN LOCOMOTIVES

What is said to be the largest locomotive in the world outside of the United States has just been shipped to China for service on the Peking-Suiyuan Railway, from the shops of one of the large American manufacturers. The length of this locomotive and tender, over all, is 94 ft. 9 in.; its total weight on track is 320 tons, and it will develop 3,000 hp. This is the first of seven such locomotives to be shipped for use on this Chinese railroad.

7685 CABLE STEAMER "ALL AMERICA" HAS UP-TO-DATE EQUIPMENT

The cable steamer "All America," built on the Tyne in England, arrived recently in New York. Its deadweight tonnage is 1,750, and it is 295 ft. long, 37 ft. wide, and draws 18 ft. There are three cable tanks forward and one aft, all of which have steel cones for coiling. The total capacity is about 14,000 cu. ft. The cable machinery is of the most improved pattern. There is a large testing room on the awning deck. There are workshops with special appliances for doing cable-repair work. The vessel is an oil-burner with two sets of triple-expansion engines. Its equipment includes electric-lighting and refrigerating plants, a wireless installation, a motor lifeboat, etc. Its trial speed was 15 1/4 miles an hour.

7686 STATES GET SURPLUS WAR MATERIALS FOR ROADS

One hundred and fifty million dollars' worth of surplus war materials have been turned over to the Department of Agriculture by the War Department for distribution to the various states for road-building purposes. This material and equipment include 10,000 tons of TNT, 4,500,000 tons of powder, 25,000 tons of rails, 27,198 motor vehicles, and 172 locomotives.

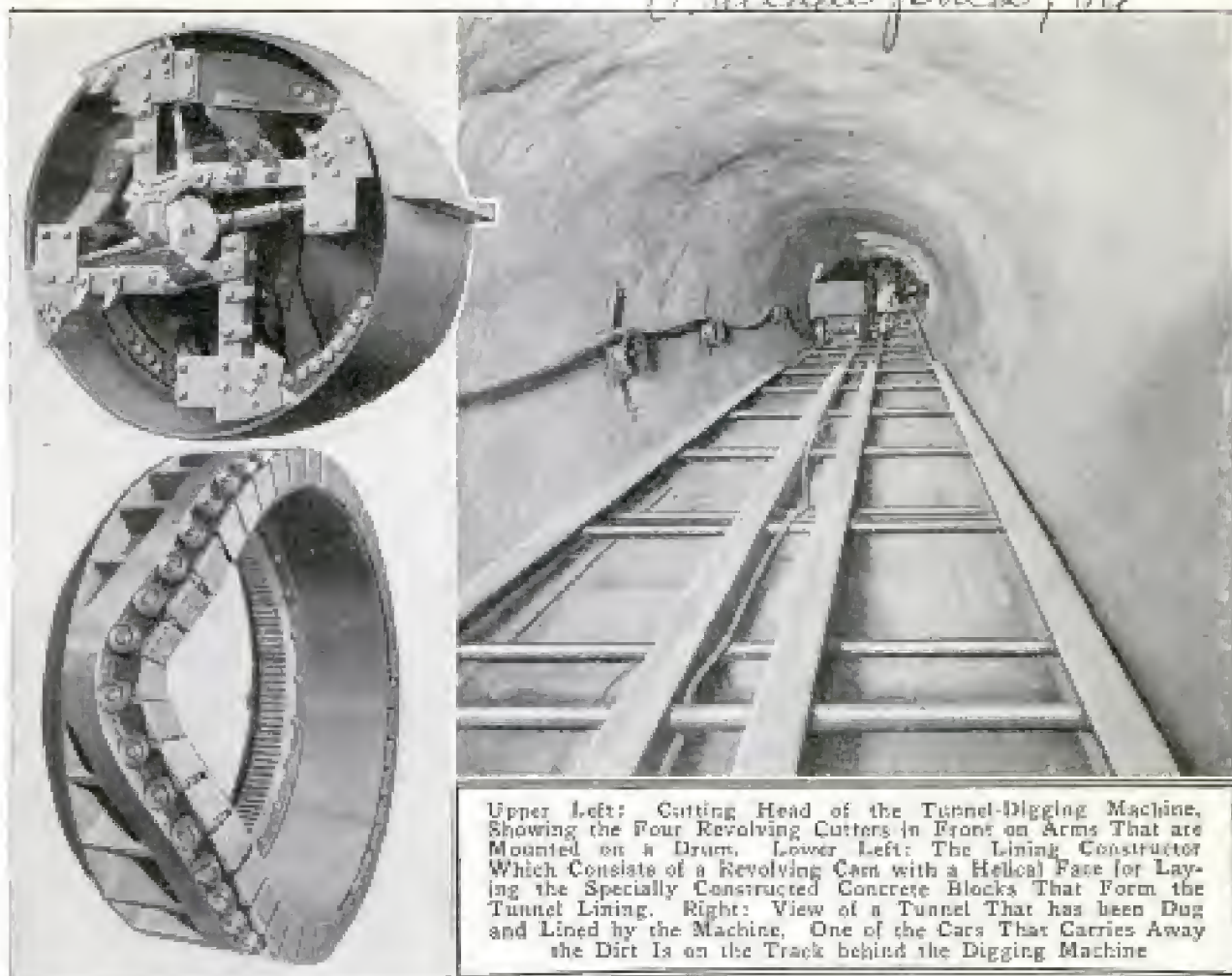
7545 TUNNEL-DIGGING MACHINE ALSO LINES WALLS

Digging a tunnel, removing the earth, and lining the walls with concrete blocks as the tunneling advances, are all accomplished by a single recently developed machine. The method is claimed to be more rapid, safer, and cheaper than the open-cut or ordinary underground methods. Four revolving arms at the

Above is illustrated the First of a Number of Very Large Locomotives Which are being Built by One of the American Manufacturers for Service on Chinese Railways. Hard Service on the Railroads of the United States has Proved That This Is the Highest Type of Motive Power for Heavy Freight Duty. The 16 Wheels Afford Great Tractive Power

7685 11/12/21

292-25 U.S. Dept. of Agriculture 4/10/11



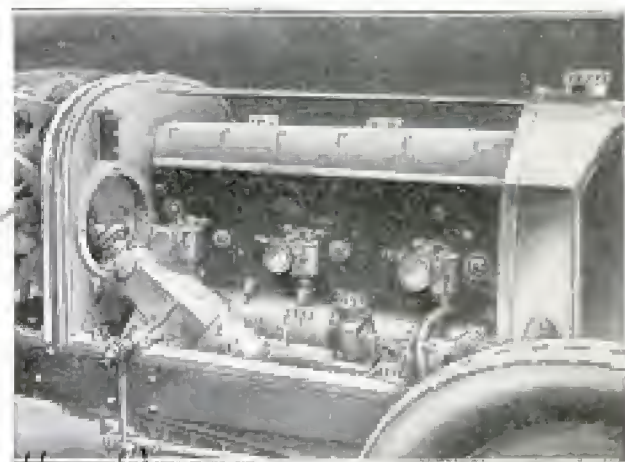
Upper Left: Cutting Head of the Tunnel-Digging Machine, Showing the Four Revolving Cutters in Front on Arms That are Mounted on a Drum. Lower Left: The Lining Constructor Which Consists of a Revolving Cam with a Helical Face for Laying the Specially Constructed Concrete Blocks That Form the Tunnel Lining. Right: View of a Tunnel That has been Dug and Lined by the Machine. One of the Cars That Carries Away the Dirt Is on the Track behind the Digging Machine

front of a cutting head, mounted in a steel drum, carry the cutters which remove the earth. It is deposited, by buckets, on a conveyor belt, which carries it to cars, brought up from the rear. Behind the cutting head are the gearing and mechanism for controlling the direction of the cut. Back of this is the lining constructor, which lays concrete blocks designed so that when they are pushed into place they expand and fit tightly against the earth wall. They are laid in spiral courses, giving a forward motion to the machine, which keeps the cutting head in contact with the tunnel heading. This machine, operated by an electric motor, has constructed 18 ft. 8 in. of finished 52-in. tunnel in four hours.

THREE CARBURETORS ON ENGINE OF FRENCH MANUFACTURE

Three carburetors on one engine presented an odd appearance at a French auto show recently, and was the subject of much comment. The engine is of 40 hp., and has six cylinders. When three carburetors are fitted, two of them supply independent groups of cylinders, for high power and speed, while the third sup-

plies all the cylinders at low speed, or "loading range," as it is called. Thus, if a motor car has an engine with six cylinders, these are divided into two groups of three, and one carburetor feeds each group when high speed is desired, or when heavy power is needed, as in hill climbing. The third carburetor feeds all of the cylinders at low speed, or at times when the engine is left running while the car is stopped.



The Three Carburetors can be Plainly Seen Mounted on the Side of the Six-Cylinder Engine. These Carburetors Supply Different Groups of Cylinders at Different Speeds

isobron, France

Ans. Arthur J. Hard,
6 Wausau Wis.

POPULAR MECHANICS

STOOL FOR WEEDING GARDENS TO PREVENT BACKACHES

Backaches and sunburn are no longer necessary consequences of weeding the garden. A combination stool and um-



Seated on a Garden Stool, Weeding Is Less Tiresome, and When the Job is Done, the Umbrella is Taken Down and the Outfit Wheeled Away

brella has been invented to make the gardener's work less of a burden. The seat is mounted on two legs and two wheels so that it may be tilted up and wheeled about like a wheelbarrow. Legs and wheel supports have a telescoping adjustment to obtain exactly the right height, and a lateral adjustment allows the stool

to be placed over rows of different widths. A large sunshade is attached to the edge of the seat and may be tilted to just the right angle. With this stool astride the rows, the gardener works in comfort, moving it along as his work progresses.

"THERMOS" CARS AND TRUCKS TRANSPORT MILK

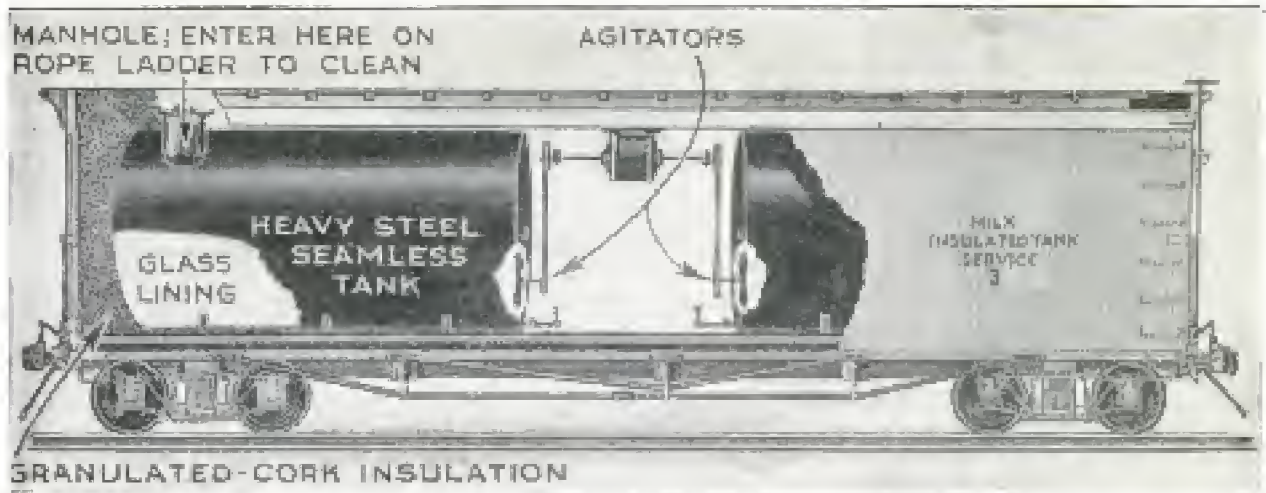
Tank cars for oil are a common sight, but tank cars for milk are something distinctly new. The first installation of this kind was made recently for a large dairy in Pittsburgh. Two 2,500-gal. steel tanks are mounted on each car. These tanks are of heavy welded plate steel with a glass lining, and are insulated with cork. Fused into the metal at extreme heat, the glass forms a smooth surface which is easily cleaned and will stand severe usage. Inside each tank is a motor-driven agitator. Run for five minutes before emptying the tank, it gives uniformity to the contents.

Milk, chilled to a temperature of 38 to 40°, is maintained at that temperature in the tanks without further refrigeration. In a 106-mile run, during the hot weather, milk has remained in these cars for eight hours with a change of only 2°



These Milk Tanks are Mounted inside of Box Cars. The Illustration Shows the Tanks through the Sides of the Cars as Though Transparent. The Space between the Tanks and the Sides of the Cars is Packed with Cork

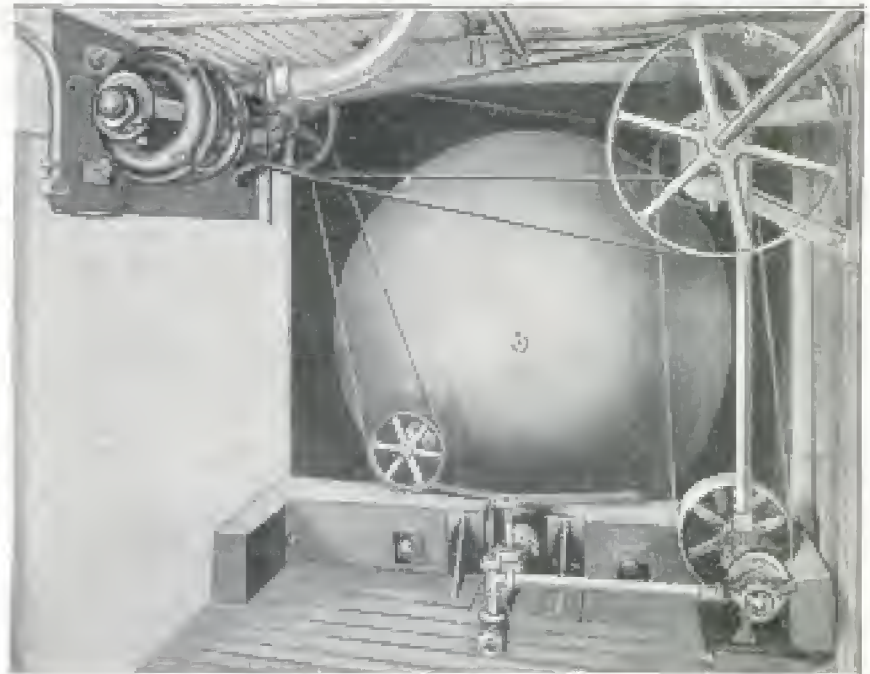
The Pfander Co., Rochester, N. Y.



Construction of the Milk-Tank Cars, Showing the Arrangement of Tanks, Manhole for Cleaning, Agitators and Motor, and Insulation: The Milk is Transferred from These Tanks into Motor Trucks, Also with Glass-Lined Tanks, for Conveyance to the Dairy

in temperature. Perfect drainage in emptying the cars results in a loss of only 2 gal. out of 5,000, through milk clinging to the tank walls. Where cans are used, $\frac{1}{4}$ pt. clings to each 10-gal. can, a loss of 16 gal. out of 5,000. Similar tanks are mounted on wagons and motor trucks for hauling the milk from the railroad to the dairy or collecting it along country roads.

These tank cars greatly reduce the cost of han-



The Inside of a Car, Showing the End of One Tank, and the Motor and Gears Operating the Agitators for Mixing the Milk and Cream



Glass-Lined Milk Tanks are Also Mounted on Trucks for Collecting Milk along Country Roads or for Long Hauls from the Railroad Tanks. With Horse-Drawn Tanks for Short Hauls, All Requirements are Met

dling milk. The Pittsburgh installation requires only three cars. Seven cars were needed when cans were used. It has done away with the services of a

3½-ton truck and seven men. It is estimated that the saving for one year will be approximately two-thirds of the original cost of the tank cars.

3480
**OIL MEN STRIKE "GASSER"
INSTEAD OF A "GUSHER"**

All sorts of unexpected things happen in the production of oil, and one of the most unusual and interesting was the



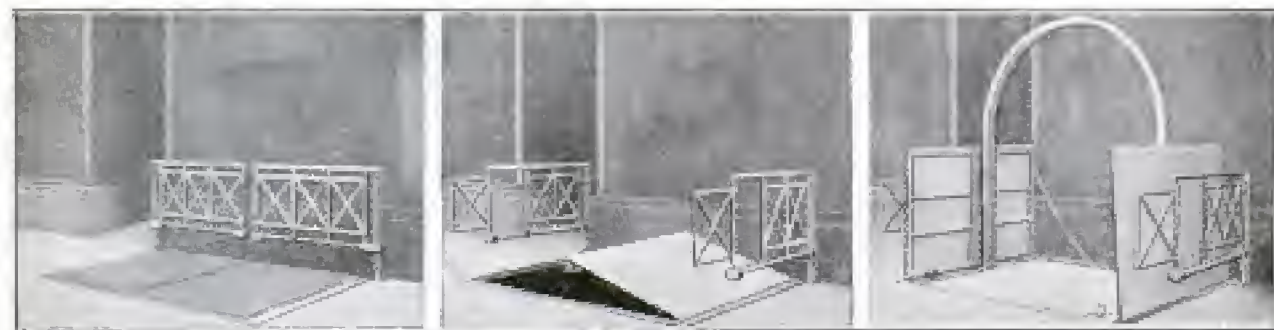
A Flame of Burning Gas, 400 Feet High, from a Well Which was Drilled for Oil; The Gas was Accidentally Ignited by a Lantern When the Well "Came In"

"gasser" in a field near Long Beach, Calif. This well had been cemented off and was expected momentarily to "come in." About one o'clock in the morning, a great explosion shook the entire city. It was the well coming in, but instead of oil it

proved to be gas. As the jet of gas struck the derrick, a lantern hanging at the top was blown off and the gas became ignited. A column of fire, 400 ft. high and several feet wide, shot into the air, illuminating the surrounding country. The roar could be heard for miles and the heat was intense. It was estimated that there were 300,000,000 cu. ft. of gas burning during a 24-hour period. For the first two hours the column of fire remained at a height of between 350 and 400 ft., and then died down suddenly for a few moments. A second explosion started it afresh, and it remained burning for two days. Pipe lines were constructed, and the well was filled with dirt, which extinguished the fire. The well proved to be a wonder.

754
**SIDEWALK ELEVATOR GATES
REMOVE ALL DANGER**

If newly constructed guards, or gates, are used, no one need fear the sidewalk elevators which rise so suddenly, and sometimes without warning. The gates lie flat against the building when not in use, but when the elevator begins to ascend, the gates are automatically swung outward by the movement of the elevator mechanism. The descent of the elevator causes the gates to swing back against the wall of the building again, entirely out of the way of passers-by. An added feature of the gates is that they can be adjusted so as to stop the elevator if a pressure of 10 lb. or more be applied against them. Thus, should a child happen to be standing on or near the covers when the elevator starts, a slight pressure would stop the machinery and avoid accidents.



Left: The Gates Folded Back against the Building. Center: The Gates are Shown Automatically Opened by the Rising Elevator. Right: The Elevator is Seen at the Sidewalk Level

Shur-Loc Elevator Safety Co.
62 W. 45th St. New York City.

7569

Capt. John G. Peaty

Wrigley Bldg Chicago

"DAM IS BREAKING!"—HEARD FOUR MILES

Human Voice Broadcast over Vast Area—Flood Warnings Given
to Isolated Communities and Individuals—Feat Made Possible
by Remarkable Tests Conducted in Catskill Mountains

By H. A. LANE

TERRIBLE disasters have been caused by the irresistible swirl of rushing floods, in which unsuspecting persons were caught without warning. In one instance, years ago, a gay party on a four-horse tallyho was enthusiastically exploring the wonders and beauties of Turkey Creek Cañon, near Golden, Colo. Gathering rainclouds failed to cast a shadow upon their high spirits, and no serious thought was given to danger from the rapidly approaching storm, because the tourists were not familiar with the characteristics of the local tempests, nor with the topography of the surrounding country.

The storm suddenly burst with great fury upon the unprepared pleasure seekers, and the deluge of water caused them quickly to abandon the tallyho and hunt for shelter. Closely huddled against the towering sides of the cañon, they soon realized, with anxiety, that they had not reckoned with the forces of nature. The terrific rush of water down the cañon sides swept them from their feet, and down to the bed of the cañon, where a torrent of water now raged. Despite their struggles, many of the party lost their lives, and those surviving were seriously injured.

Another instance was the great flood at Johnstown, Pa., which happened many years ago. Much of the disaster, and many fatalities could have been prevented if warnings had been hurled through space in advance of the cruel waters.

More recent was the disastrous flood at Pueblo, Colo., where the toll of lives, and property damage, reached enormous proportions, much of which would have been averted, had some kind of warning been given.

As a protection against such terrible events as these, a system of huge telephone transmitters and amplifiers has been produced, which will throw the human voice a distance of four miles. Extensive tests have been made with this apparatus, which have proved the practicability and success of the endeavor. These tests were conducted in the Catskill Mountains, by a specially trained group of operators. A tower, 30 ft. high, was erected to hold the gigantic amplifiers and the immense projectors which measured 15 ft. in length and 4 ft. in height.

To determine just how far the human

voice could be heard with these aids, was accomplished in rather a weird manner, because the time selected was at night. Four men took up previously agreed-upon stations, at distances of one, two, three, and four miles from the tower. As the time drew near for the experiments, the four men applied matches to specially prepared torches, which gave large flaring flames.

Meanwhile, at the tower, were gathered a party of men chosen to observe the tests, and who interestedly watched the tiny flickering torches in the distance. When the "zero hour," or time set for the tests, arrived, the operator at the tower took his place before the transmitter of the apparatus, and in a natural tone of voice, ordered the far-off men to wave their torches.

Breathlessly the watchers at the tower peered through the inky blackness at the flickering points of fire, and the nearest torch was seen to describe vigorous circles in the air. Exclamations of satisfaction came from the watchers, which rose to a shout, as the second, then the third, and finally the fourth torch was seen to dip and wave wildly in the darkness, thus showing plainly that all the men had heard the command. The operator at the transmitter then spoke to the men again, in reply to their ready signals, and bade them wait for further instructions.

The next test was made with a phonograph, which was placed before the transmitter, and several records of well-known music were produced. Before playing the machine, the operator spoke to the waiting torch bearers, telling them what the nature of this test would be, and instructing them to make a note of the tunes, and the order in which they were played. After he had delivered his orders, he again asked them to signal him if they understood the instructions. And again the four torches waved vigorously.

Several pieces were then played with the instrument, and at their conclusion the tower operator announced briefly to the far-away listeners that the experiments were completed and that they should extinguish the torches and make their way back. The party at the tower then saw the torches disappear, one by one, into the blackness of the night.

When the men returned, each was

Photographs from Oliver's Magazine, Vol. 1, No. 1, p. 10. Washington, D.C. The Transmitter





found to have a correct list of the tunes, and the order in which they were played. Thus every one of the tests proved a suc-

cess, and the time, labor, and money expended were considered small in comparison with the results obtained.

A NEW KIND OF HORSE SHOW

BY FRANK B. HOWE

EVERY now and then some courageous soul, with sufficient boldness to kick over the traces and upset the estab-

recent Pacific-coast show completely upset precedent when they announced that entered horses must actually perform their specialty, instead of being led past the judges by a groom. In other words, polo ponies must play polo; saddle horses must be ridden through all the various feats that prize saddle horses are supposed to accomplish; chariot racers must draw chariots, and so on.

The innovation was a complete success, and the crowded grandstand testified to the public's approval of the change. According to psycholo-

gists, the public like action. They got it here. Instead of the tedious procession of innumerable horses, they first saw a group of horses play polo. Then another group staged a chariot race. Some fine stallions performed various feats designated to show their intelligence. A number of cow ponies went out and showed



A Chariot Race Not Only Displayed the Merits of the Horses but at the Same Time Furnished Real Entertainment for the Spectators

lished custom, comes along and introduces an innovation in some traditional undertaking. If he can stand the criticism, he generally contributes something to humanity.

In this case the "kicking over the traces" figure is appropriate, for the subject is a horse show.

Heretofore, at such events, helpless spectators have sat in the grandstand and watched the "thrilling" spectacle of an unending procession of horses being led past a little group of judges. After some hours of this, a man with a megaphone announces that such-and-such a horse has won; the chief judge pins a blue ribbon on the animal's bridle, and the crowd departs.

Determined to make their horse show as interesting for the spectators as it was for themselves, a group of horsemen at a



A Cowboy Putting One of the Competing Stallions through Various Paces to Test and Show Its Intelligence; Similarly, Saddle Horses and Animals of Other Classes Performed Their Specialties

how they helped their cowboy riders brand cows. After this, horse-show audiences are not likely to be content with the "procession method" of judging.

¶Tolls for a telephone call from Chicago to California, by which the purchase of a down-town Chicago building site was arranged, amounted to several hundred dollars. A 21-story office and shop building will be erected on this, and adjoining, property.

BLIND AND DEAF GIRL DEVELOPS WONDERFUL SENSE OF TOUCH AND SMELL

By FRED L. HOLMES,

115 W. Main St.,
Madison, Wis.

READING the wireless telephone by the sense of touch is the new accomplishment of Willetta Huggins, age 16, the blind and deaf girl of Janesville, Wis. By placing her fingers on the diaphragm of the receiver, she gets the vibrations of the human voice and is able to understand. She has been blind and deaf for three years. Without instruction, she has developed in that time an uncanny sense of touch that seems, in a measure, to take the place of her lost faculties.

During September, 1921, the girl discovered that by placing her finger upon the diaphragm of a telephone receiver she could read conversation. She has always had the faculty of speech. With this discovery she soon learned that she could conduct a telephone conversation almost as well as any normal child of her age. But Willetta Huggins' sense of touch was to be given a new thrill. The girl was

brought to Madison, Wis., on last November 1, to visit Gov. John J. Blaine. She was taken to a news-service office to ascertain if she could read the wireless telephone, and a score of persons, including Maj. E. A. Fitzpatrick, secretary of the State Board of Education; Mrs. J. T. Hooper, superintendent of the blind school at Janesville; J. G. Crownhart, newspaper correspondent and wireless operator, and a score of others were asked to be present.

Arrangements were made with Prof. E. M. Terry, head of the department of physics at the University of Wisconsin, and Malcolm P. Hansen, wireless operator, to send the girl a message

by radio telephone. No one in the room knew what the message would be. To the amazement of the audience, the blind and deaf girl with her fingers in the two receivers was able to read this message:

"My dear Miss Huggins: I am glad to have the privilege of addressing such

a remarkable girl by radio telephone. Never before have science and a wonderfully developed human sense together effected such a transmission of intelligence. Good-bye. Good luck. — Malcolm P. Hansen, Wireless Operator."

"He calls me 'dear Miss Huggins,'" declared the girl as soon as the message was

started and she laughed about it as if it were a slight embarrassment to be so familiarly addressed by a stranger.

When the message had first been received, Mr. Hansen repeated it, fearing that the girl had not received it the first time it was transmitted.

"He is repeating it," said Miss Huggins. "I know what he said the first time."

When the repetition of the message had been completed, after coaxing by Mrs. Hooper, she told the people present, almost word for word, what the operator had sent her.

But a still more striking demonstration of her sense of touch was to be given. After the message had been completed by the use of the regular telephone, it was transmitted to the receiving office and typewritten. Half an hour later, after many other experiments had been tried with the girl, success-

fully—the telling of colors by the sense of smell, and the denomination of bills



A Highly Developed Sense of Touch Enables This Girl, Who Is Absolutely Deaf, to Read a Wireless-Telephone Message by Placing Her Fingers on the Diaphragms of the Receivers



Equal to Her Sense of Touch Is That of Smell, by Which She Distinguishes Colors

by touching the numerals on them—she was handed the typewritten sheet and asked if there was a message on it. She ran her hands over the typewritten wording.

"Oh! This is the same message they



By Placing Her Hands upon Their Chests or Heads, She Is Able to Carry on a Conversation with Two Persons at the Same Time

sent to me from the university," she exclaimed.

The radiophone message sent by the university was on a wave length of 800 meters, and the instrument used in taking it off was an audion detector with a one-step amplifier with but a 50-ft. two-wire antenna on the roof of a three-story building. The audibility of the message was sufficient to enable those who were not equipped with receivers to hear the entire message while Miss Huggins read it with her delicate fingers, repeating phrases that amused her as they traveled through the ether. While the same radiophone set has been heard as far as Independence, Mo., the fact that this little girl was able to put her sensitive forefinger on the diaphragm of the receiver and thus read the message, amazed the expert physicists and wireless experimenters of the university.

Almost as marvelous as is the girl's sense of touch is her sense of smell. She can tell how many people are in the room

by this sense, and how many are strangers. Willetta Huggins was locked in a bank vault at Chippewa Falls and given six envelopes, each containing yarn of a different color. She wrote the answers on each envelope correctly.

"What is the color of my waist?" asked one girl. She smelled.

"It's white," declared the blind and deaf girl, "but the collar is edged with yellow."

"And the color of my suit is what?" asked Governor Blaine. The girl put her nose to the cloth.

"It's gray and black—a mixture," came the girl's correct answer.

Miss Huggins is a human sounding board. She places her hand on your head or shoulders and is able to conduct a conversation in rapid order, or she can conduct two conversations with two people at the same time.

Willetta Huggins was slow and plodding in her school work when a child. With failing eyesight she was sent from her home at Chippewa Falls to the school for the blind at Janesville when 10 years of age. In October, 1919, without any forewarning, she suddenly became stone-deaf. A year later she was stone-blind. For six months she groped despondently in the dark. She refused to be comforted. One day she brushed against one of her teachers who was talking and got the vibration of her voice. Then she placed her hand on the teacher's head and found that she could understand. Since then her development has been rapid.

"Willetta Huggins is a wonder," said Superintendent J. T. Hooper. "Not herself, but what she may teach to the educational world may be more wonderful than education alone. With defective sight and defective hearing, two imperfect avenues of approach to the brain, she was dull, stolid, discontented, and made no progress whatever in intellectual development. Even the work with her hands was much inferior to what it is now. When these two imperfect avenues of approach were cut off and she was forced to use the most perfect avenue of all—the sense of touch—she immediately became interested, happy, intelligent, and made very rapid progress both with her head and hands. The question arises in my mind if we are not attacking the educational problem from the wrong angle. Should not every child be made perfect in so far as possible by the physician, the nurse, and social worker before being sent to the educator?"



Giant Floating Crane Belonging to the Port of Liverpool, England, in the Act of Lifting from Its Abutments a 150-Ton Bridge: It Carried the Bridge down the River Mersey from New Brighton to Seacombe, a Distance of Nearly Two Miles, to a Repair Shop

FLOATING CRANE TAKES BRIDGE TO REPAIR SHOP

After lifting bodily a bridge weighing 150 tons from its abutments at New Brighton, Eng., a giant floating crane carried the bridge a distance of about two miles down the river Mersey to a repair shop at Seacombe. This mammoth crane, which has a lifting capacity of even more than 150 tons, was originally intended for Russia.

ATTACHMENT TO ASSIST BLIND TYPEWRITER OPERATORS

A blind Englishman, a victim of the war, has invented an attachment which enables him to operate and fully control a typewriter. Difficulty was found in determining when the end of the sheet was being reached and in taking out and reinserting sheets. The attachment that overcomes these troubles consists of a trough-shaped aluminum stamping. A flat spring, with its end wound on a spool at the top, passes through the trough and terminates in a clip. The paper is inserted in the clip and held by a screw. A projection on the clip enables one to set the

paper absolutely square. A tiny point sticks into the paper so that its exact position can be determined if taken out and reinserted. As the end of the paper



This Device, Attached to the Carriage of an Ordinary Typewriter by Means of the Bracket, Enables a Blind Person to Control the Machine

approaches, the clip operates a trip lever and rings a bell. Braille characters stamped on the side aid in the adjustment to any length of paper.

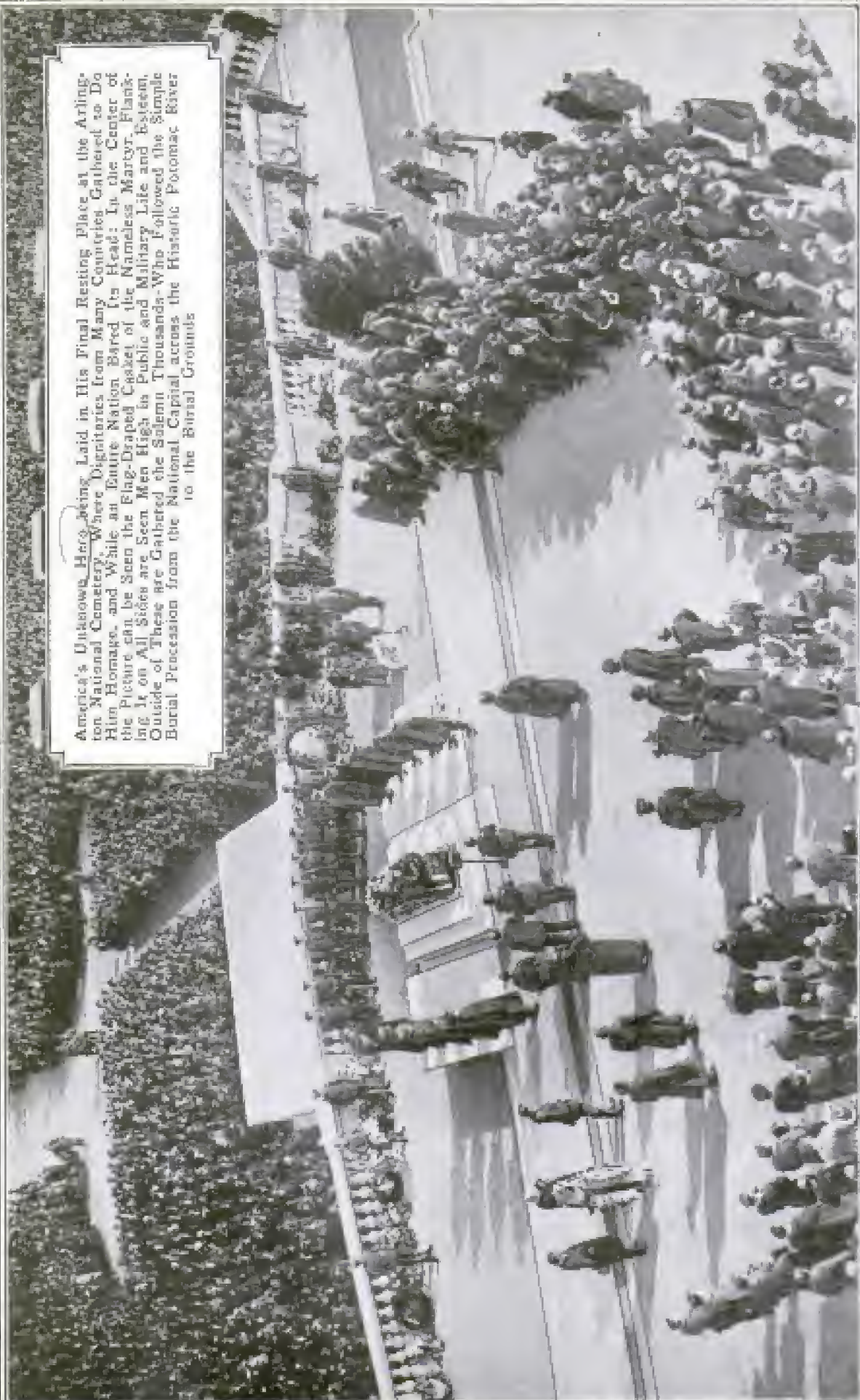
When you want anything and do not know where to get it, write Bureau of Information, Popular Mechanics, Chicago.

Mr. George Pringle, 140 Bishops Road,
Chelmsford, England.

Comment: How to enable

7676

America's Unknown Hero Being Laid in His Final Resting Place at the Arlington National Cemetery, Where Dignitaries from Many Countries Gathered to Do Him Homage, and While an Entire Nation Bared Its Head: In the Center of the Picture can be Seen the Flag-Draped Casket of the Nameless Martyr. Flanking It on All Sides are Seen Men High in Public and Military Life and Es- timate Outside of These are Gathered the Solemn Thousands Who Followed the Simple Burial Procession from the National Capital across the Historic Potomac River to the Burial Grounds



REEL WORLD PHOTO, 1229 W. 43rd St. New York



Copyright, Associated Press Co., 97-7th Avenue, New York
In the Center are Seen the Flag-Draped Caskets Containing Four Unknown Heroes. From These Four Bodies, Exhumed in Different Cemeteries in France, One was Chosen to be Taken "Home" to Receive the Greatest Honors Ever Bestowed upon a Hero. The Honor Guard Shown Here is Composed of American and French Soldiers

THE STORY OF THE UNKNOWN HERO

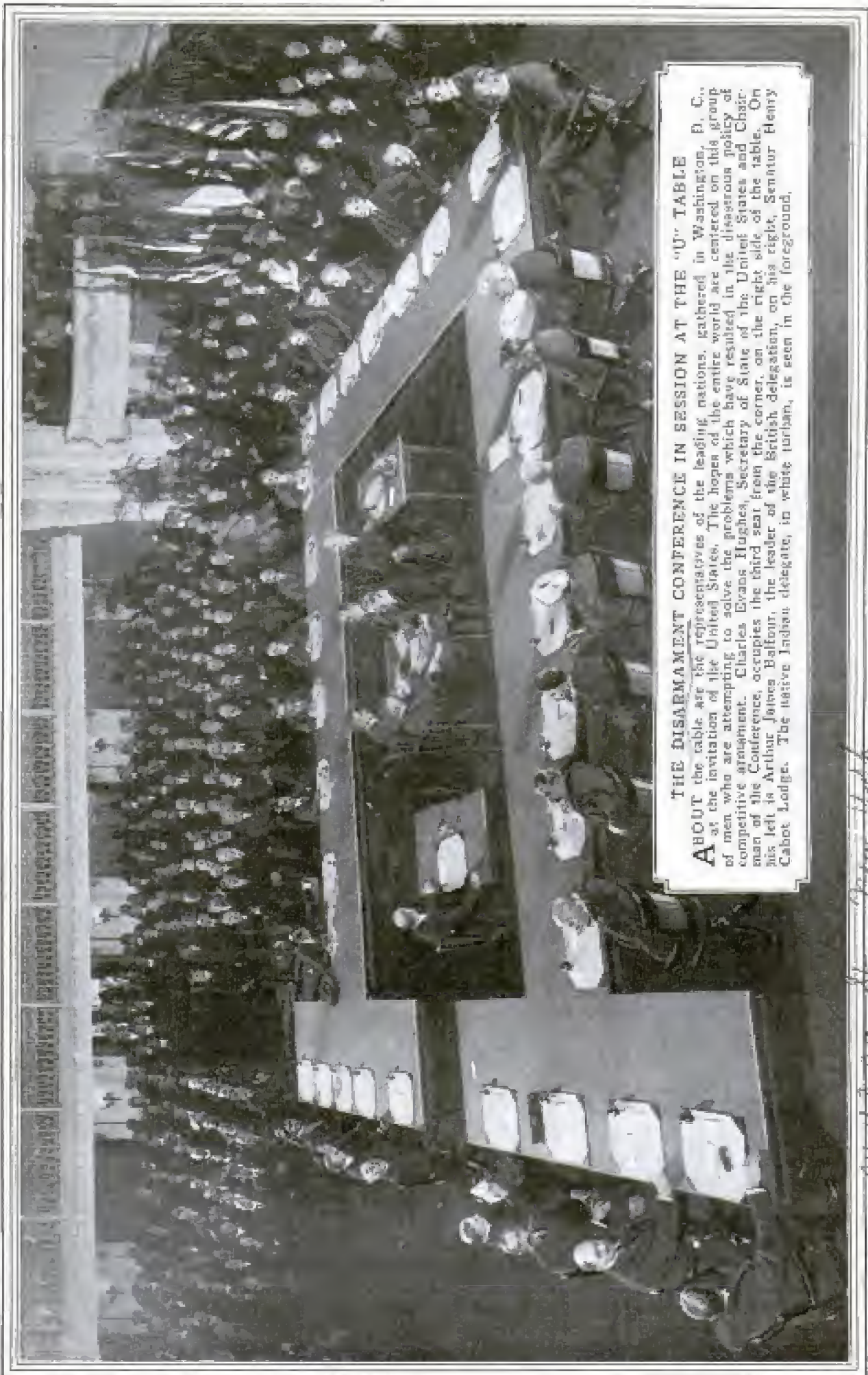
IN solemn silence, on October 23, specially chosen bodyguards took up their honorary posts beside the exhumed remains of four American heroes, in as many different cemeteries, in France. From these four widely separated localities, the bodies were taken to Châlons-sur-Marne. At this city, the guards were amazed to find three other detachments of soldiers, who were guarding similar charges, because it was commonly known that only one body was to be taken to America. To add to their mystification, they were all temporarily relieved from duty.

In order that the identity of these martyrs might be forever lost to the efforts of delving historians, or selfish individual interests, measures were taken thoroughly to "unidentify" the bodies. During the night, while the guard was relieved, persons unknown to the soldiers took the remains from the caskets, and interchanged them. The caskets were also shifted about, so that when the guard was posted the following morning, none could have told which body reposed in any particular casket.

With simple solemnity, one of the bodies was then designated as the one to be prepared for the long journey back over the ocean, and "home." Not, however, to the home whence came the soldier in performance of his duty, but to a home in which he would be buried with the greatest honors ever accorded a military hero. Orders were then given to take the caskets containing the bodies of the three remaining, and thus honored heroes, to the cemetery at Romagne-sous-Montfaucon, where they were interred without ceremony.

Because of these efforts by the government to obliterate all individuality and personality from this Unknown Hero, the reverential solemnity of his burial in the Arlington National Cemetery expressed a nation's devotion to the memory of the thousands of soldiers who found eternal rest beneath the soil of France.

7735



THE DISARMAMENT CONFERENCE IN SESSION AT THE "U" TABLE

ABOUT the table are the representatives of the leading nations, gathered in Washington, D. C., at the invitation of the United States. The hopes of the entire world are centered on this group of men who are attempting to solve the problems which have resulted in the disastrous policy of competitive armament. Charles Evans Hughes, Secretary of State of the United States and Chairman of the Conference, occupies the third seat from the corner, on the right side of the table. On his left is Arthur James Balfour, the leader of the British delegation, on his right, Senator Henry Cabot Lodge. The native Indian delegate, in white turban, is seen in the foreground.

side page 3 page 13, 229 W. 43rd St. New York

7721

John W. Kean, Bureau of Navigation
Navy Department, Washington D. C.ELECTRICAL ACHIEVEMENTS SIGNALIZE
UNKNOWN HERO HONORS

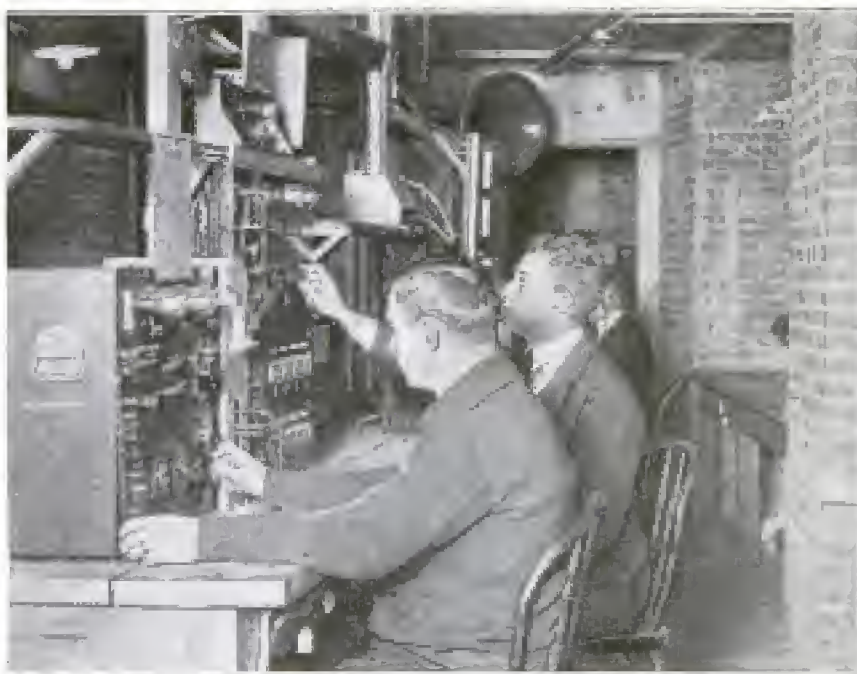
BY JOHN W. KEAN

Soldier, Unknown in

WIDE WORLD PHOTOS *234 W. 43rd St. New York City*
President Harding Delivering the Funeral Oration over the Remains of the Unknown Hero at the Arlington Cemetery Amphitheater: In Front of the President is Seen a Stand Which Contains a Specially Made Telephone Transmitter to Carry the Speaker's Voice to the Amplifier Room in the Basement of the Amphitheater

A MECHANICAL device, operated in connection with a highly efficient communication system, transmitted President Harding's address, delivered over the remains of the unknown soldier at Arlington Cemetery on Armistice Day, to our Atlantic and Pacific coasts. With the aid of this device thousands in and around the beautiful amphitheater at Arlington, other thousands in and around Madison Square Garden, New York City, and still other thousands in and around the Civic Auditorium at San Francisco, heard the President's every word.

While speaking, the



This Is the Amplifier Room in the Basement of the Arlington Amphitheater, Showing the Apparatus Used to Broadcast the President's Address to the Thousands in Attendance There as Well as to New York City and San Francisco

President stood near a small box, about 4 in. square, which rested on a little stand. In this box was a black disk like the ordinary telephone transmitter, but, in fact, a new special type of transmitter developed within the last few months by the engineers of the American Telegraph and Telephone Company, and successfully demonstrated for the first time at Arlington.

The commercial telephone transmitter is efficient for its purpose, but it has a tendency to accentuate certain tones in the voice. In ordinary conversations this is not particularly noticeable, but when used in connection with voice-magnifying devices, these improperly accented tones become very pronounced. This difficulty has been entirely overcome in the amplifier used at Arlington with the new transmitter.

Working to this end the engineers said in effect: "We are taking the voice of the speaker as sent through the ordinary transmitter, with its imperfections, and amplifying it; suppose we try reducing the sound of the voice and then amplifying it."

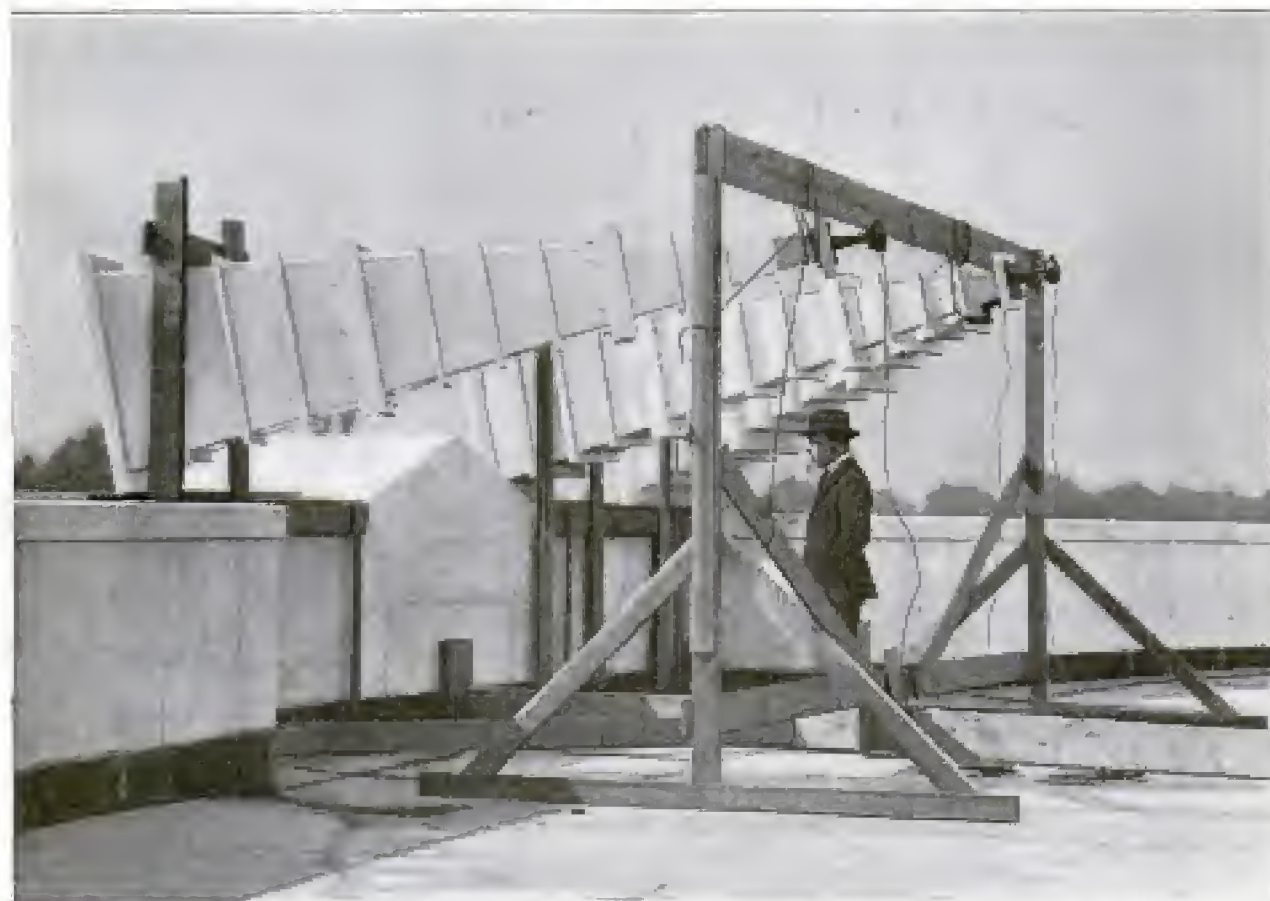
Following this theory they developed a transmitter with an abnormally high

frequency which transmitted the voice in a much weaker tone than the ordinary transmitter. It caught the essential vibrations, however, and maintained the character or individuality of the speaker's voice. With the aid of the amplifiers these essential vibrations were built up. The theory proved correct in practice, and the President's voice was sent out without an imperfection, to the listening thousands.

Further, to protect the new transmitter from vibrations other than those caused by the voice of the President, the little black disk was hung from the roof of the box by rubber bands, and the front of the box was covered with cheesecloth, to break any stray breeze that might wander in.

From the box, which stood near the casket of the unknown soldier, wires led to a room beneath the amphitheater stage. Here all was quiet, but the amplifiers were doing their work.

After being magnified, the electric vibrations carrying the President's address were sent over two sets of wires. One set led to telephone receivers in and around the amphitheater at Arlington, the other led to the long-distance lines



By Means of These Enormous Projectors That were Mounted on the Roof of the Arlington Amphitheater, the Thousands of Persons Surrounding the Place were Enabled to Hear Distinctly Every Word of President Harding's Speech Delivered in Honor of the Nation's Unknown Hero



Above: The Brilliant Jeweled Panel Which Forms a Spectacular Approach to the Pan-American Building Where the Limitation of Arms Conference is Held. Below: An Unusual View of the Portal with the Washington Monument Appearing in the Center. This Photo, Taken from Inside the Pan-American Building, Makes the 85-Foot Portal Towers Seem as High as the 555-Foot Monument

for transmission to receivers at Madison Square Garden, and to receivers at the Civic Auditorium, San Francisco. The diaphragms of these receivers were of specially treated linen. The electric waves passing through coils in the receiver vibrated a small armature between the coils and the poles of a permanent magnet. The vibrations of the armature



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carried to the diaphragm created the sound which was sent out by the horns, or as they are technically termed, projectors.

To insure that the people within the amphitheater, and at the other points, would hear the President's address without any echoing sounds, or other disturbances due to the amplifiers, many problems in the correct placing of the receivers

and of the horns were satisfactorily solved. So perfectly were the difficulties overcome that it was impossible for a person to tell, no matter where he was located at Arlington, whether he was listening to the President's actual voice, or his voice after it had passed through the amplifiers.



Copyright, 1918
The Dome of the Capitol Building on Armistice Night
When Added Illumination from Searchlight
Batteries was Thrown on It

And to insure just as wonderful a performance for the listening thousands in New York City and San Francisco, every possible precaution was taken.

Two 25-pair cables, one to be used in case the other failed, were built especially for the occasion, and ran from the basement room of the amphitheater to a point a few blocks away, where they were connected to long-distance lines. Each of the 25 pairs in each cable made a single circuit. One pair carried the voice current; others carried telegraph circuits, over which operators at stations in the larger cities along the line kept in continual communication. At each of these emergency stations were additional sets of amplifiers to keep the voice-carrying current up to the necessary strength for its long travel.

In Washington, current was secured from the local electric-light company, adapted by special machinery for use in the amplifiers and other equipment. As a protection against loss of power from the local company, storage batteries

capable of supplying the necessary current for several hours were installed.

The Armistice Day ceremonies were symbolic. As part of those ceremonies, and also as part of the welcome to the visiting members of the Disarmament Conference, some very beautiful decorations were erected near the Pan-American Building and the Continental Memorial Building. Both buildings, and also the Red Cross Building, which is in this group, are of beautiful white marble, classic in design.

On Seventeenth Street, near the Pan-American Building, two obelisks—miniature Washington Monuments, 85 ft. high—were erected. These obelisks were covered with imitation jewels made in Austria. In refractive power they are about halfway between cut glass and diamonds.

Between the towers was swung a banner, also contrived of these jewels, 34,000 in all, in seven different colors. Woven into the banner were designs representing the flags of the nations that have sent delegates to the conference.

Armistice night, President Harding touched a button, and batteries of searchlights played on the jeweled banner. As soon as the lights were turned on, a battery of four French guns, located near the Washington Monument, fired a presidential salute—21 guns. As the smoke from the guns drifted toward the heavens, other batteries of searchlights played on them in red, white, and blue colors. Still other batteries bathed the dome of the Capitol and the Washington Monument in light. In all, these searchlights represented 4,950,000 candlepower.

From the President to the plain citizen, who was on hand to the number of 50,000, the illumination was pronounced a beautiful sight.

U. S. S. "MARYLAND" SPEEDIEST ELECTRICALLY DRIVEN SHIP

The U. S. battleship "Maryland," at its official trials, November 14, developed a speed of 25.9 miles an hour, being a record for electrically driven ships of its class. The contract speed was 24.18 miles, which was exceeded on five high-speed runs by more than .86 of a mile. Successful anchor-gear tests were also made. The full-load displacement of the "Maryland" is 33,590 tons, with a developed horsepower of 36,673. The "Maryland's" sister ship, the "Tennessee," has never exceeded a speed of 24.6 miles an hour, and has never developed more than 30,909 horsepower.

Engineering World

Nov 1920. P. 316

Army & Navy
11/14/21

EPOCH-MAKING TESTS OF FOUNDATION PIERS

Tests of the Piers for the New Union Station at Chicago That may Revolutionize the Allowable Load on Piers and Caissons in the Future

BY HENRY S. WHITE

BY ACTUAL test, the determination of the exact conditions resulting from placing on a foundation pier three times its allowable load is a thing that has never been done as it is now being done, in connection with the new Union Station at Chicago. The results obtained will be valuable not only to the designers of this huge building, but will also be of incalculable benefit in the design of all future buildings in Chicago, or any other city with similar soil conditions.

For the purpose of carrying out these tests, two special foundation piers were sunk in the railway yard, where tracks were available for transporting the steel that was to be used and for operating the traveling crane erecting it. These piers are of 4-ft. diameter, one with a belled base and the other without one. The bottom diameter of the belled base is 8 ft. 4 in., having, therefore, an area of $54\frac{1}{2}$ sq. ft. The piers are sunk to hardpan, which is at a depth of a little over 70 ft. By city ordinance, the allowable load on hardpan is six tons per square foot. The main purpose of these tests is to demonstrate that this load can be at least doubled with

perfect safety on the foundation piers of the new station building, and, by inference, on any future buildings in Chicago. To make this demonstration more positive, the piers are being tested, not only with double, but with three times the allowable load. That means 18 tons to the square foot, and as the area of the base of the belled pier, which is the one now being tested, is $54\frac{1}{2}$ sq. ft., the load required—18 times $54\frac{1}{2}$ —is 981 tons. Therefore, in order to make the test, over 1,000 tons of steel were piled up above the pier. For the accommodation of a biting jack, that will be described later, the steel had to be supported on two piles of wooden cribbing made of railroad ties, at an elevation of 11 ft. 4 in. above the ground level. On top of this is placed, on each pile of cribbing, a row of eight 24-in. I-beams, and on top of these are piled, crosswise, 30 layers of 130-lb. rails, 33 ft. long, to the number of about 1,400, with a total weight of over 1,000 tons—as great a weight as all the structural steel in a fair-sized office building. This load is carried by the wooden cribbing.

As much of the load as is desired is transmitted to the top of the pier by means of a 1,000-ton jack, which is



Huge Pile of 130-Pound Rails Supported on Cribbing for Testing a Foundation Pier of the New Union Station Building at Chicago; In the Pile Are Over 1,400 Rails, Which Laid End on End would Stretch Nine Miles

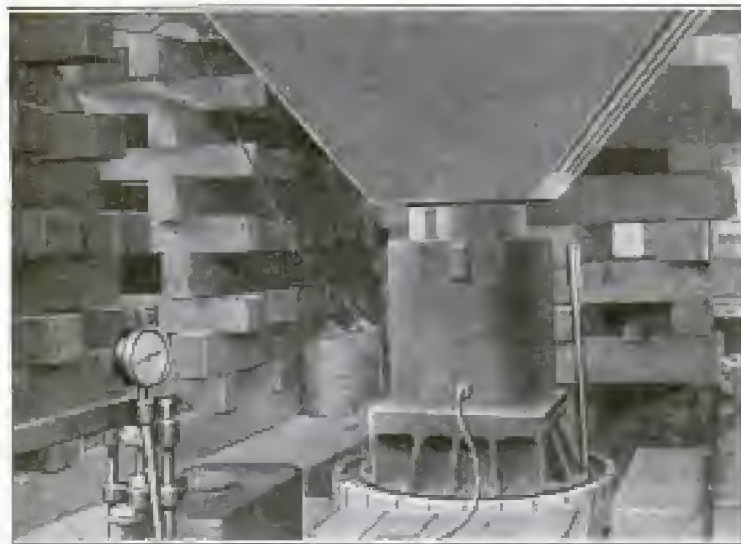
the first of its kind ever built. Although the jack has this enormous lifting capacity, its cast-steel cylinder operates a

a check, duplicate readings of the settlement are made with a surveyor's level.

Thus, absolutely precise data will be obtained of what happens to these foundation piers after a prolonged test of three times the allowable load, and it is expected that it will be proved to the satisfaction of the city authorities that double the allowable load can be put upon the foundation piers of the station building, all of which are now in place.

A very interesting feature in connection with these tests is an experiment that is to be made when the bearing value of the hardpan has been determined. It is then intended to sink a shaft beside the pier, and burrow out from beneath its belled base all the supporting hardpan. Observations will then be made of the load supported by the resistance of the skin friction alone be-

tween the surface of the pier and the surrounding soil. Such an investigation has never been made before, and the results will be of great value to architects and designers. At the site of the tests, hardpan is at an elevation 25 ft. above bedrock.

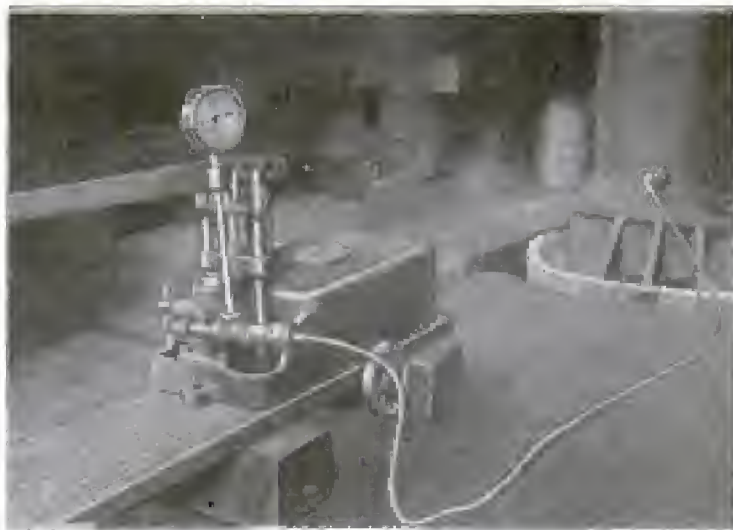


One-Thousand-Ton Lifting Jack, the First of Its Kind Ever Built: It Is between the Cast-Iron Base That Rests on Top of the Pier being Tested, and the Much Larger Casting Above That Supports the Load It Lifts

semisteel lifting ram of only 21-in. diameter. Its over-all height is 3 ft. 1 in. By calculation it will be seen that the pressure required on the ram is nearly 6,000 lb. per square inch. Connected with the jack by a heavy $\frac{1}{2}$ -in. pipe is a plunger pump that, by means of a liquid known as hydraulic oil, applies the required pressure. In the pipe line is a gauge that registers the number of tons lifted by any pressure, so that it can be seen at a glance what load is being carried by the pier. Any settlement of the pier is read on what is known as a differential draft gauge. Connected with the jack is a vertical tube containing colored alcohol, such as is used in spirit thermometers, and this is piped to the gauge, which is inclined at an angle of about 15° , so that any fall of the liquid in the vertical tube is exaggerated in the sloping gauge, and very close readings can be made. As



Differential Draft Gauge upon Which is Read with Great Precision Any Settlement of the Pier under Test: The Inclination of the Gauge Exaggerates the Fall of the Colored Alcohol in a Vertical Tube to Which It is Connected



Plunger Pump That, with a Pressure of 6,000 Pounds per Square Inch, Lifts the Ram in the Jack When Loaded with 1,000 Tons

THIRTY-SIX DESTROYERS MOORED AT ONE PIER



THIRTY-SIX destroyers of the United States Navy, moored at a wharf at San Diego, California, represent an original outlay of over \$50,000,000. They are some of that class of swift fighting vessels which so conspicuously proved their effectiveness as weapons against the submarines during the World War. This is the largest group of destroyers ever moored together at a single wharf.

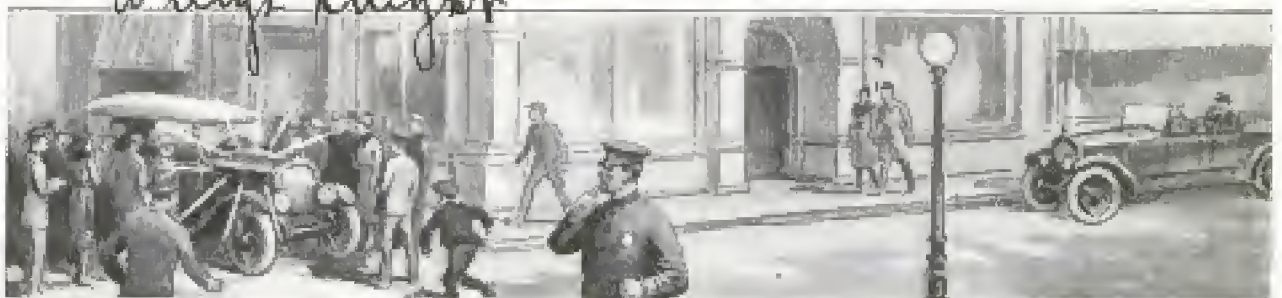
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AMPLIFIER MAKES AUTOMOBILE "SPEAK FOR ITSELF"

Automobile salesmen have found a new and ingenious use for the vacuum-tube amplifier in putting over their slogan, "The Car That Speaks for Itself." A new car, with the slogan displayed on it, is parked at the curb, and the amplifier is hidden in it. A small wire, along the gutter, connects it with a transmitter in another machine, a little distance down the street. The salesmen sit, unobserved,

in the second machine and talk into the transmitter. The voice, magnified so that it may be heard for quite a distance, comes from the empty car which seems literally to "speak for itself."

Two thousand five hundred live geese recently arrived in London, Eng., coming all the way from Danzig, Poland. They composed one of the first shipments under the barter trade arrangements which for some time have been in effect between England and Poland.



A Voice, Issuing from an Empty Automobile Standing at the Curb of a City Street, Quickly Draws a Curious Crowd Which Sees and Hears Nothing but the Machine Apparently Explaining Its Own Excellence

2725 E. 14th St.
Cleveland, Ohio
Magna Vox Co. Capt. Latimer J. Wilson
Apr. 21. 3406 Broadway, N.Y.C.

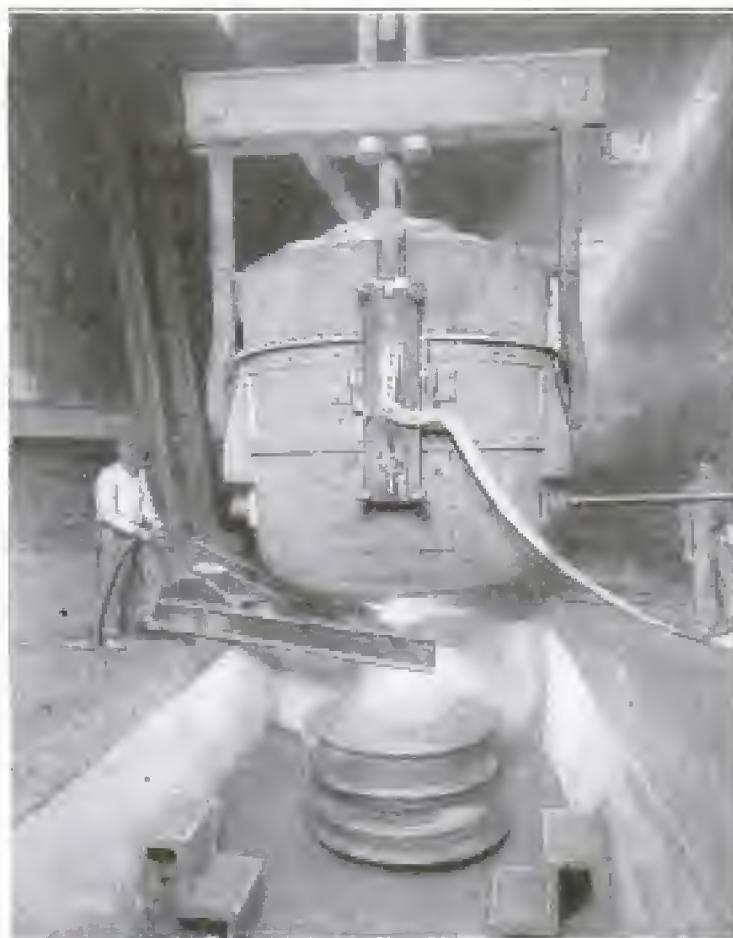
STEEL CAR WHEELS MADE IN REVOLVING MOLD

The manufacture of steel car wheels has grown to very large proportions, and there are now several kinds of such wheels in use on American railroads. Demand for these wheels, as distinguished from the chilled-iron wheel, has been increased by the use of the heavier steel passenger and other cars.

One of the most novel and interesting steel car wheels now being produced is a cast-steel wheel as distinguished from a solid or forged-steel wheel, and is poured in a revolving mold. The object of this is to throw the steel by centrifugal action to the outside of the

mold, where it will chill first and form the outside, or rim, of the wheel. An

important feature of this process is the injection into the steel of powdered manganese in the early stages of the pouring. The addition of manganese makes the steel much harder—it really forms manganese steel in the rim of the wheel. As the mold fills up, the introduction of manganese is gradually diminished and stopped, so that the central part of the wheel is plain steel, or steel with very little manganese in it. The interesting process is now being commercially exploited on a large scale.



Revolving Mold in Which Steel Car Wheels are Cast: The Man with the Hose, Which is Directed under the Ladle, is Injecting Powdered Manganese into the Molten Metal As It Runs from the Ladle into the Mold

Y-SHAPED THREE-WAY BRIDGE CROSSES TWO STREAMS

Between Fayetteville, N. C., and McColl, S. C., there is a bridge which is

unusual in the fact that it is built in the shape of a letter "Y," with roads leading in three directions. At this point two large creeks approach within 10 ft. of each other, but are separated by a solid rock ledge and do not actually come together for more than 15 miles. This 15-mile stretch between the streams is a prosperous section of land and is reached by means of the peculiar bridge, the middle pier of which stands between the two streams. One arch crosses each creek, and a gap at the side admits the road from the district below to the bridge.



The Approaches at the Left and Right Are from McColl and Fayetteville. That in the Foreground is the Road Leading from the District between the Creeks

Names and addresses of manufacturers of articles described in this magazine will be furnished free by our Bureau of Information.

COMMENT AND REVIEW

[These pages were printed November 22, 1921.]

TODAY is Armistice Day. As I write, traffic throughout Chicago and other cities is at a standstill for one minute; whistles are blowing; bells are ringing; the people are reverently, silently, facing toward the East, where lie so many of our brave young men on the fields of France. Three years have passed since the conflict ceased. Children, on that day too young to comprehend what it all was, are today old enough to understand. In only six years more the boys will be old enough to fight.

Armistice Day

Will they have to?

Is it necessary that they should?

Time lays such a subtle, comfortable blanket of forgetfulness upon us all, are not we who did understand rapidly drifting into a state of apathy in this matter? Not that those who lost sons or relatives or dear friends can ever forget, but the great majority of our people have not this personal tie. Because the volcano has exhausted itself for a time, and has ceased to pour out its molten death and stifling gases, shall those who escaped return in blind faith that such a cataclysm can never repeat itself?

In our own interest, and that of world-wide humanity, let us lend our voice and influence to every possible means which leads to ultimate international peace; and as each must sacrifice something if this result is secured, let us, with willing hearts, not hesitate to make ours.



NOT since the conference of the far-journeying shepherds to the manger cradle in Bethlehem has there assembled a gathering of as momentous portent as that now in session at Washington. Secretary Hughes' unheard-of diplomacy in presenting, at the very start, something concrete on which to work at once, was a master stroke which will live in history as a most brilliant example of statesmanship. The response from the delegations, to whom the proposal came with a suddenness which was breath-taking, was both prompt and hearty and full of promise. Events in the conference are apparently moving with progress most unusual in a gathering of this kind. Nothing more cruel or wicked can be conceived than that anyone should utter

one single word which might cause distrust or hesitation, or give personal offense to any of our visiting delegates from beyond the seas.



IT MAY seem a bit sordid to make reference to what war is costing us, you and me, today, in dollars and cents. Yet it need not be concealed. Of all the Federal taxes we pay, 93 per cent is going to pay for wars past and future. Our people surely do not realize this enormous drain, but if the war tax could only be separated, and every time a man paid his taxes he paid in at one window \$7 for all other purposes of government, and then was obliged to step to another window marked "War Tax" and pay his \$93, he would wake up and cry in real distress, "For God's sake disarm."

Our War Bill



CHARLES SCHWAB, one of the greatest steel men of all times, deserves his reputation for sincerity. The thousands of his own men, the thousands of friends—those who know him best—believe him most. It is therefore a shock to certain jingo pacifists, who so loudly shout "Wars are made and fostered by the steel interests for purposes of selfish gain," to have a man like Mr. Schwab wipe out their entire claim with one pungent sentence. Before the American Iron and Steel Institute, and in the presence of Marshal Foch, he made the public declaration. After establishing the fact that his company, the Bethlehem Steel Corporation, is the largest war-material manufacturing works in the world, and has therefore more to lose in

the shape of steel shipbuilding yards, costly machinery, etc., than any other, he said: "If the statesmen now assembled in Washington find it possible to bring about disarmament and permanent peace I will gladly see the war-making machin-

Setback for Jingo

N. Y. Evening Post
11/19/21

ery of the Bethlehem Steel Corporation sunk to the bottom of the ocean. Such a thing as financial loss can be of no consideration when compared to the inestimable boon to mankind which would be involved in the realization of that magnificent plan."



WHILE certain interests have managed to secure the defeat in Congress of a proposed sales tax of one per cent on money actually collected, the measure is one which is undoubtedly destined eventually to be adopted. It has failed at this time because public sentiment was not sufficiently roused to its support. Public sentiment failed in its support because it is either uninformed or misinformed. When once the public comes to really understand this plan of taxation, it will rise and insist upon its adoption. Under its operation goods can be made and sold more cheaply, and this without any necessary reduction in what is paid for labor. Where the purchaser of goods over a counter has been paying 23 per cent extra to anticipate an excess profits tax, the sales tax imposes at most an average of about 3 per cent all told, from raw material to delivery wagon. It is so simple to estimate and collect, millions will be saved in determining and collecting the amount due. At the end of each month, or 12 months, each taxpayer will have a clean slate with the Revenue Department, and will not be called on to pay large sums, which as now, the Revenue Department, by means of new rulings, declares should have been paid five or six years ago, but which it declared at the time was not reportable or collectable. The annoyance, exasperation, and humiliation which are daily inflicted upon countless honest men could no longer occur. Business of all kinds would immediately know "where it was at," and would respond. With the proposed exemption of \$6,000 a year, the man of small business would pay less than now, and large interests would have no complaint at what they had to pay.

The Sales Tax

It must be admitted that a sales tax would require a good many thousand less inspectors, investigators, expert accountants, and clerks than now, for practically any boy or girl in the eighth grade could make up the report for a large corporation in a few minutes. It is natural that politicians with patronage to dispense to relatives, friends, and helpers, should oppose any measure which so largely deprives them of their perquisites. As the country weekly used to say, they "view with alarm" such a possibility. That, however, is politics, not patriotism. The time is coming when these same politicians in Congress will see something besides the sales tax to view with alarm, when they come home to tell their constituent voters about the glories of the Grand Old Flag.



DOUBTLESS, as an outgrowth of the war, when national expenditures grew from thousands into millions, and from millions into billions, a spirit of extravagance seems to have been engendered. To the men in Congress apparently anything counted in less than millions appears small and trivial.

Stop Federal Aid

Of the new national expenditures the good-roads appropriation, divided among the several states, seems to be the most practical and satisfactory. National highways have been every country's vital necessity for centuries. With thousands of miles of steam railway extending to every corner, the United States has for 75 years been able to get along without building government roads. With the advent of the automobile, however, city

and country are now agreed on state and government coöperation in road building. All parts of the country are undoubtedly in better accord on this one question than on almost any other large national expenditure.

That roast beef and pie may properly constitute two items of a good dinner is no reason for making an entire menu of either. Under Federal aid to states the government says, "Here is a fund, if you put an equal amount with it." This means an increase in taxes payable to the state, and also the state's part—and even proportionately more—of a like amount which its citizens must pay the government. Naturally the states with smaller properties to be taxed pay less than their ratio in proportion to many of the rest. In other words, certain states are thus over-taxed to help other states. This is manifestly unfair.

By literature and billboards the government constantly urges thrift and economy, but the principle of Federal aid to states works the opposite result. The

various interests which are to fatten on the vast sums spent, naturally use every effort to secure favorable action by Congress, and are organized for the purpose.

At the present moment there are pending in Congress bills for appropriating \$169,000,000 for additional state aid. This amounts to an extra tax of \$5 per average family, which, with the extra state tax, amounts to \$10 per family per year, and it is estimated this will have reached \$100 per family in 10 years, if contemplated plans are allowed to get a start.

It is always helpful to know how the same thing worked with other people. In 1843, the British national grants for aid were £244,000 (about \$1,200,000); this has grown to £65,000,000 today, or nearly \$300,000,000. As far back as 1885, Gladstone urged "a discontinuance of the system, as a burden upon labor and industry." He found, as we will, the system is a bribe to extravagance, abetted and subtly encouraged by an organized lobby and propaganda by those few who would personally benefit financially. The profiteering scoundrels of the late war would be multiplied and continued indefinitely.

All but those who expect to share in the rake-off are urged to write their senators and congressmen immediately and say, "We will not stand it."



WITH millions of the food producers starving in Russia, deprived of their live stock, and lacking even seed for planting, little surprise is occasioned at the report which shows the mining industry also paralyzed and almost extinguished.

Idle Mines Tell Sad Story

Where in the first six months of 1913 there were mined 9,000,000 tons of iron, in six months of 1921 this had dropped to 100,000 tons; copper fell from 1,000,000 to 4,400 tons, and manganese from 1,280,000 to 3,600 tons. The dark story pictures not so much the thousands of unemployed miners, but thousands of artisans which Bolshevism has slain or scattered, and hundreds of industrial plants either destroyed or partly wrecked and closed.

What is true of the farms and factories is equally so of all other lines of productive activity and business.

Aside from the natural sympathies which go out to starving men, women, and children, the world owes a debt to these helpless unfortunates whom fate has seized as the unhappy background on which to project, where all may see, the terrible results of the bolshevistic dream of a government which tried to reverse the processes of natural laws which commenced on this earth with the creation of man. From the day the attempt was made to the present moment, the path of the Russian people has been over the dead bodies of their countrymen along an ever-descending path into an awful living hell. The object lesson has been tragic to the last degree, and would have been impossible of so long endurance in any country where a free press was permitted to reach a people who could read.



WITH good roads increasing in every state, and long sections being linked up to make through routes, long-distance travel by motor has already assumed large proportions and is growing each year. The past summer, cars carrying

Motor Hotels

licenses of Texas and other southern states, from the central West as far distant as the Rocky Mountains, and even from the Puget Sound country, thronged New England and Quebec. In winter, Florida is filled with cars from points as far distant as Maine and Colorado and all the states between.

With the great increase in the number of these motor travelers, it is inevitable that a corresponding increase in the number of those who desire to travel in greater comfort than at present must also result. To provide larger sleeping quarters, hot and cold water, baths, a living room, kitchen, and other conveniences, necessarily calls for larger and heavier car bodies. To accomplish this, already motor trucks with special springs have been used to carry these small one-story houses. A wealthy Frenchman has used an army truck for the purpose, and in this country trucks are being used in the same way. As the roads reduce their grades and take on a smoother surface, these combined sleeping and observation railless cars will increase.

The great majority, however, of middle-aged and younger people will not exchange their tent, cot, and sunset supper around a campfire by the side of a brook, for all the fresco-painted, satin-lined, plate-glassed movable mansions which all the trucks in the country can carry.

H. H. WINDSOR

MIDGET X-RAY APPARATUS IS IMMERSSED IN OIL

An important advance in the development of X-ray apparatus has lately been announced by Dr. W. D. Coolidge, of the General Electric Company's research



Using the Midget X-Ray Apparatus for Dental Work: The Patient is Seen Holding the Focusing Cone to Her Face to Concentrate the Rays

laboratory, pertaining to the absolute elimination of all danger from contact with the apparatus. The safety feature is accomplished by inclosing the tube, high-voltage transformer, and stabilizer, within a small oil-filled metallic case, which weighs but 20 lb. Heretofore the smallest X-ray machine weighed 150 lb., and consisted of four units. This new midget was built to give the world a tiny X-ray machine, and to eliminate the possibility of electric shock.

Physicians or dentists can now carry the X-ray machine to the bedside of the patient, for the purpose of radiographic work, as it fits into a small case no larger than the common portable typewriters require. For office use, it can be hung on a bracket arrangement. This new development is made in two units of 40,000 volts and 10 milliamperes, and 60,000 volts and 50 milliamperes. The tube is the smallest ever produced.

The Sphere, elect. 22, 1/121
Minneapolis Journal 9/25/21
St. Louis Dispatch 9/16/21
MECHANICS
7526 L. d. Illustrations 10/20/21
EXPEDITION AIMS TO SCALE
HIGHEST PEAK ON EARTH

During the last few months the first stage of the attempt to scale the peak of Mount Everest, 29,002 ft. above sea level, the highest summit on the earth, has been completed. This was the exploration and charting of the region of the mountain in the heart of the desolate Himalayas. The work was done by the Everest expedition, consisting of a small party of Englishmen, under the leadership of Col. Howard Bury, all trained mountain climbers. They were accompanied by many Chinese coolies and burden-bearing yaks, beasts that can live on scant herbage. After several months of exploration around the summit, carried out from different bases simultaneously by splitting up the party into groups, finally, at an elevation of 23,000 ft., the only way open to the summit was found in the northeast quarter of the surrounding zone. At other points there were found such obstacles as precipices towering 10,000 ft. above a huge glacier confronting the would-be climber, impassable gorges making the summit inaccessible. The most formidable task of the undertaking will be the ascent of the last 4,000 or 5,000 ft. of the summit, and this is left for the second stage of the undertaking.

LAYING HENS ARE TRAPPED WITH AUTOMATIC NEST

An Iowa poultry raiser has constructed a nest, which has many good features, for the purpose of trapping laying hens. The nest is made of galvanized-iron sheeting, and is of the proper size to accommodate one hen. The laying surface is made of heavy canvas, which is stretched across the bottom and fastened to a hinged trap-door. When the hen enters the nest, her weight upon the canvas automatically pulls the door shut, and a hook arrangement holds the door closed until some



Left: The Trap Nest Empty. Center: As It Appears After the Hen has Locked Herself Inside. Right: Three Nests under One Roof

one releases the fowl. Thus the poultry raiser can get any information desired concerning the laying habits of his flock.

W. S. C. Belding
Mason City, Iowa
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Mr. Victor X. Ray Corp. Chicago
236 S. LaSalle St.



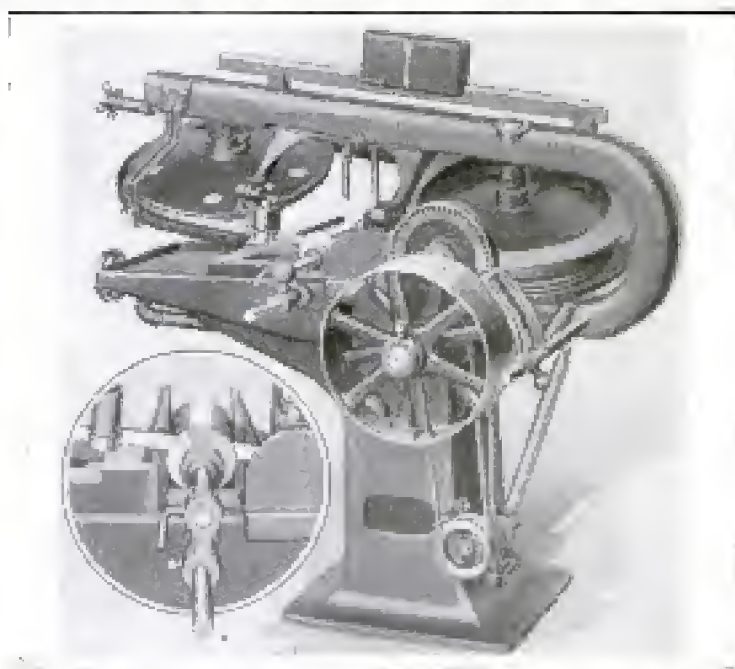
FIRST ROYAL AIRPLANE BUILT FOR KING ALBERT OF BELGIUM

THIS airplane, specially built for King Albert of Belgium and bearing the king's crowned monogram on the side of the fuselage, is the first plane ever built for the use of a monarch. The Belgian King has shown a great interest in flying, and it has become a common thing for him to make trips by airplane, often flying to London and Paris. The picture was taken in Paris, as King Albert, dressed in the complete outfit of an airman, was about to take off for a return trip to Brussels, in his own machine, a two-seater biplane.

7292

METAL CUTTER HAS HORIZONTAL BAND SAW

For small capacities, not exceeding work of 4 by 4 in., a compact metal-cutting machine of the band-saw type, with the production possibilities of much larger machines, has been placed on the market recently. The band saw moves horizontally, protected by an automatic self-adjusting gravity feed which assures even cutting, regardless of varying degrees in the hardness of the metal. It is equipped with roller guides for the band saw, to insure straight cutting and freedom from vibration. The tension of the band saw is regulated by a hand adjustment on the supporting head. There is a belt-driven rotary pump, of the gear type, for wet cutting. As the cutting is done with a band saw, an exceptionally small amount of material is wasted in each cut. The machine is already in extensive use.



Machine That Cuts Metal with a Horizontal Band Saw, Driven by the Pulley in Front; At 250 Revolutions, the Cutting Speed Is 120 Feet a Minute. Insert: Part of the Table, Showing How Work Is Held While being Cut

Metal Saw & Machine Co. Inc.
Springfield, Mass.

cont. Robert E. Livingston & Co. 123,
Madison Ave., New York City.

7530

COLOSSAL GAS TANK HOLDS 15,000,000 CUBIC FEET

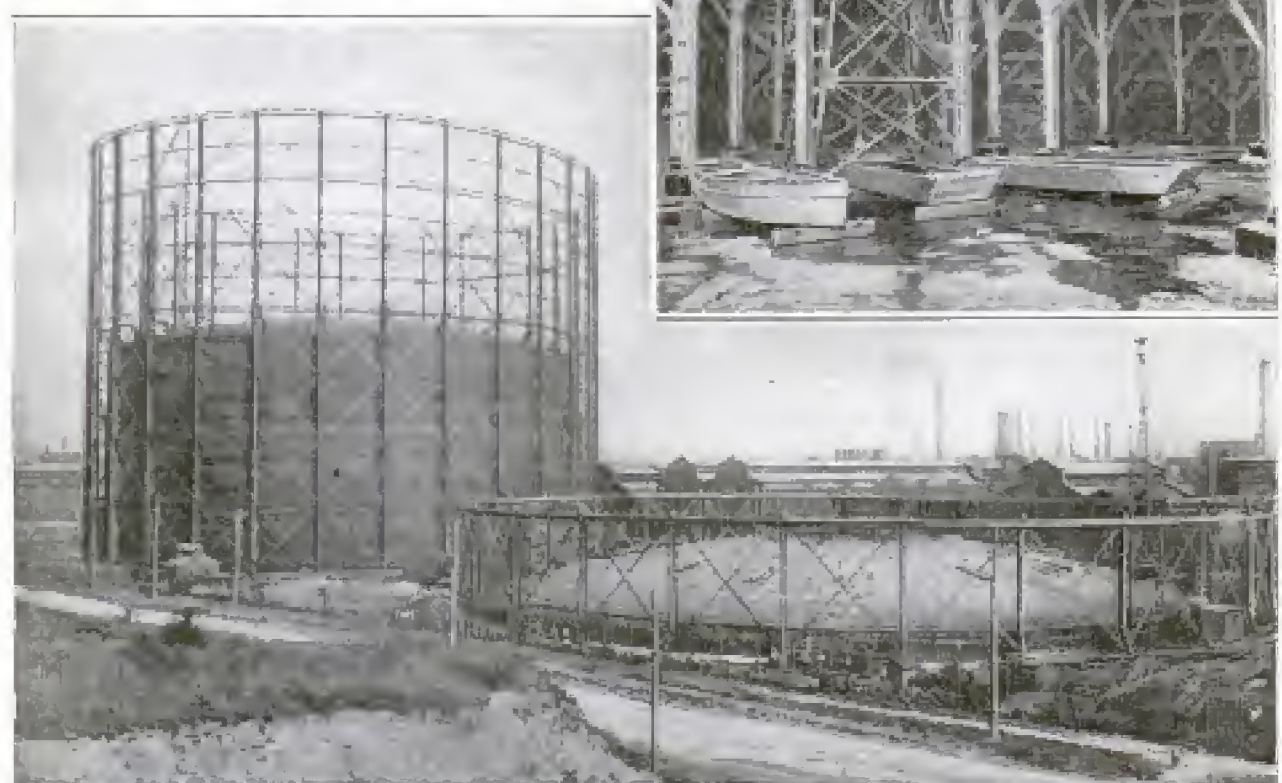
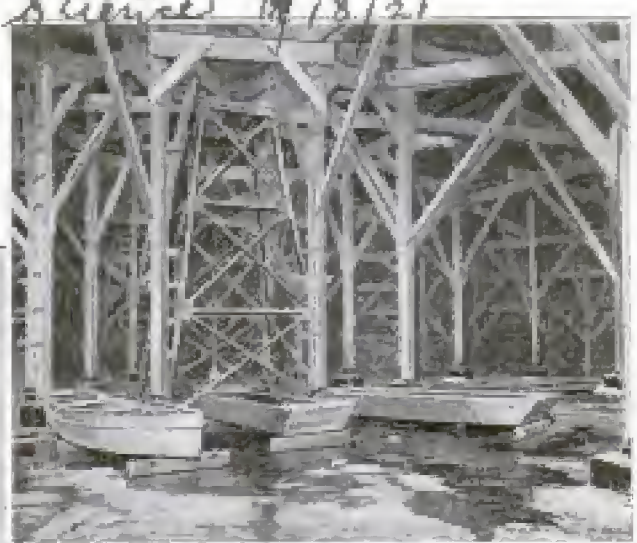
Huge things are hard to picture in the mind, and a colossal gas tank erected recently on Long Island, N. Y., comes under this head. The mammoth container has a capacity of 15,000,000 cu. ft. of gas and is the second to be completed of a contemplated plant of six such units. The enormous cylindrical sections, which rise and fall so easily with the pressure of the gas, and of which there are five, are each 48 ft. high, 300 ft. in diameter (or the length of a city block), are made of $\frac{5}{16}$ -in. steel plate, and fastened together with 2,500,000 rivets. The retaining wall at the base of the tank, which holds the water required to prevent the gas from leaking out, is 9 ft. thick at the bottom, has a height of 48 ft., and tapers to a width of 5 ft. at the top. Inside of this monstrous circular wall are confined 14,200,000 gal. of water, enough to make a good-sized lake. The gas-intake and outlet pipes are 4 ft. in diameter, and there are two for each purpose.

To the casual observer, it would appear as though, in a tank of this immense size, the raising and lowering of its sections would be very difficult because of their weight. On the contrary, the crown, or top, which weighs 4,000 tons, is very light in proportion to the fitting surface

of 60,000 sq. ft. that is exposed to the gas. Any pressure of gas greater than $\frac{1}{8}$ lb. to the square inch will raise the top. The wooden framework built to hold the crown during construction, was left inside the tank to support the top when the tank is not inflated. Three small boats were also put inside the great container to stay away from the light of day, for the use of workmen in making any repairs needed within the spacious steel walls.

FOREST-EXPERIMENT STATION IS ESTABLISHED IN SOUTH

Recently, a forest-experiment station was established by the Forest Service of the U. S. Department of Agriculture, with headquarters at New Orleans, La. Experiments will be conducted in the vast timber region extending from the Atlantic coast, through the southern states, to Texas. The object of the undertaking is to work out the best methods of growing and protecting the forests, thus insuring their perpetuation.



At the Right can be Seen the Mammoth Gas Holder in Process of Construction Which will Make It a Duplicate of the Completed, and Partially Inflated, Tank at the Left. The Insert Shows the Boats That were Placed Inside of the Steel Walls and Which will Remain There Forever, to be Used by the Repairmen

Bureau of Rehabilitation, Dept. of Labor
 & Industry, Harrisburg, Pa. S. S. Riddle Chief.



Industrial Rehabilitation of Workers

By WM. A. MCGARRY
 1033 Chestnut St.
 Philadelphia, Pa.

This Young Man Lost His Leg When a Sled Barge Crushed It against a Wharf but, with the Aid of the Pennsylvania Rehabilitation Bureau, He has Been Able to Get Back into Baseball as an Amateur Pitcher and has Secured the Job He had Always Wanted, in Which He Earns a Good Living. The Bureau has Made Him Independent



WHEN he was 18 years old, Joseph Meehan lost his right leg. He was working on a sand wharf and the leg was so badly crushed against the wharf by a barge that it had to be amputated below the knee. That was four years ago, and it looked as though his days as an amateur baseball star were over, but in the season of 1920 he pitched 12 games and won 10 for the team of which he is manager, and in 1921 he has made a still better record. But more important than his return to baseball is the fact that he is now earning a good living as a barber—the job he had always wanted—instead of being a cripple, dependent on relatives or charity.

The story of young Meehan's return to industry is typical of the work which is being done by the Bureau of Rehabilitation of the Pennsylvania Department of Labor and Industry, by which he was assisted. The record of that bureau, opened Jan. 1, 1920, is the story of how Pennsylvania discovered the dollar value of the individual producer, a story of deep significance to industrial America. In fairness to that state, it must be said that the bureau was not established for gain. It was strictly a social movement, an effort to repair, in part, the wreckage caused by the hundreds of thousands of industrial accidents which occur every year. But its investment return is clearly shown by the report of the first year's

operation, by S. S. Riddle, the head of the bureau.

An appropriation of \$100,000 was made to cover operating expenses for something more than a year. Statistics show that the average production of industrial

workers in Pennsylvania for 1919 was about \$5,000. At the end of its first year the bureau had trained, or was training, 310 out of 750 men and women disabled in industrial accidents. Though some of these workers will never reach normal production capacity again, a conservative estimate gives them a capacity of \$1,000 a year, 20 per cent of the normal. This will increase production, the wealth of the state, by \$320,000 a year, a return of more than 300 per cent annually on the original investment.

But the really surprising thing, and one which suggests great possibilities of development, is that in scores of cases the rehabilitation

experiment has made men worth more. Men considered permanent burdens on relatives or society, and incapable of ever returning to work, are now earning far more than they were ever able to earn before.

One man, who is now an engineer, had been a sort of handy man for a large corporation. He lost a leg in an accident while at work. Before he left the hospital, a representative of the bureau had learned his story and obtained a line on his experience. An artificial leg was



A Wooden Leg, and the Bureau Made a Yard Engineer of This Former Handy Man



A Blind Piano Tuner and a One-Armed Blacksmith Are Two of the Men That have been Enabled to Learn New Vocations and Renew Their Earning Power after having been Forced Out of Their Former Industrial Activities through Accidents

waiting for him when he recovered, and, after consultation between the bureau and officials of the corporation, the latter agreed to give him a job as an engineer of a yard locomotive after a short period of training. He already knew the yards and was familiar with the work of the yard engine. He went back to work in a more responsible position and at greater pay than he had ever had.

In the act creating the bureau it is stated that, "rehabilitation shall mean the rendering of a physically handicapped person fit to engage in a remunerative occupation." It provides that when an injured person is unable to meet the expense of living, the bureau shall allow him a maximum of \$15 a week for maintenance during training for an occupation within his possibilities.

"The aim of our program is to render workers, disabled in industrial and agricultural pursuits, capable of earning a living at tasks they can perform without un-

due hazard," says the report, "work where advancement is possible; where their disabilities will not render them likely to lose their employment in event of a great supply of able-bodied labor; preferably at tasks for which they have a special aptitude or past experience."

From this it can be seen that the program is an individual affair. It applies to "any resident or residents of the commonwealth whose capacity to earn a living is in any way destroyed or impaired through industrial accident occurring in the commonwealth." There is no "red tape." The injured person is not compelled to apply for aid; the bureau goes to him. The law now provides that all industrial accidents be reported daily to the Bureau of Workmen's Compensation, and from there all records of permanent disability go to the Rehabilitation Bureau. While the victim is still in the hospital, he gets a questionnaire asking for information



After being Blinded, This Man, Aided by the Bureau, Learned Typewriting and Piano Tuning. He Plans to Open a Musical-Instrument Store

that will enable the bureau to decide just how it can be of help to him. When this is returned—and experience shows that it is nearly always returned—an adjuster visits the man in the hospital. He finds out not only what the patient can do but what he wants to do. The point of the training given by the bureau is often found in these desires.

Many of the men have secretly wished to be "something better" while working at hard labor or menial tasks, but have never found the chance to change. Then, in the despair of misfortune and the belief that their usefulness is ended, they admit they would like to do something different. The bureau arranges to have an examination made, often by competent psychologists. It learns whether it would be worth while to provide the training which would be needed.

In one case a young man, 20 years old, lost his arm. He told the adjuster that for a long time he had wanted to be a wireless operator. He was the sole support of his widowed mother, so arrangements were made for a lump-sum payment of his compensation award. With that he was able to start a small candy and cigar store which provided sufficient income for the two. The young man then joined an evening class,

under the direction of the bureau, to study wireless telegraphy.

The success of the bureau's activity is undoubtedly due to the fact that it



A Hand Loom in His Home, Provided by the Rehabilitation Bureau, Enables This Blinded Man to Support His Family



Training in the Evening Class, under the Bureau of Rehabilitation, to Achieve His Ambition to Become a Wireless Operator

operates as an aid which the state owes to the injured person, not as a charity. Again and again it has awakened the desire to work in men who had become despairingly reconciled to a life of uselessness. Once these men are shown that they can be of service, they are always enthusiastic and willing to do any amount of studying to attain that end.

How this work operates for the benefit of the state is illustrated by the case of a Polish laborer who lost his right hand. The bureau provided him with a new hand, sent him to an Americanization class and procured for him a job as a hospital orderly. It was arranged to have his wife come on from her native land to join him, and finally he was put into position to rent a farm, where his past experience made him a valuable citizen.

Fully to appreciate what this kind of service means, it may be well to point out that the 310 persons assisted last year were supporting 454 dependents. A total of 166 obtained artificial appliances through the bureau, the cost being paid out of the state fund in some instances. At the end of the year, 47 were still receiving regular weekly maintenance, while studying such courses as telegraphy, motor mechanics, traffic management,

salesmanship, commercial courses, including cost analysis and accounting; Braille reading and writing, piano tuning and carpet weaving, for the blind; mechanical drawing and machine design, a teachers' course in the state normal school, watchmaking, and other skilled occupations. The rest of the men had become self-supporting.

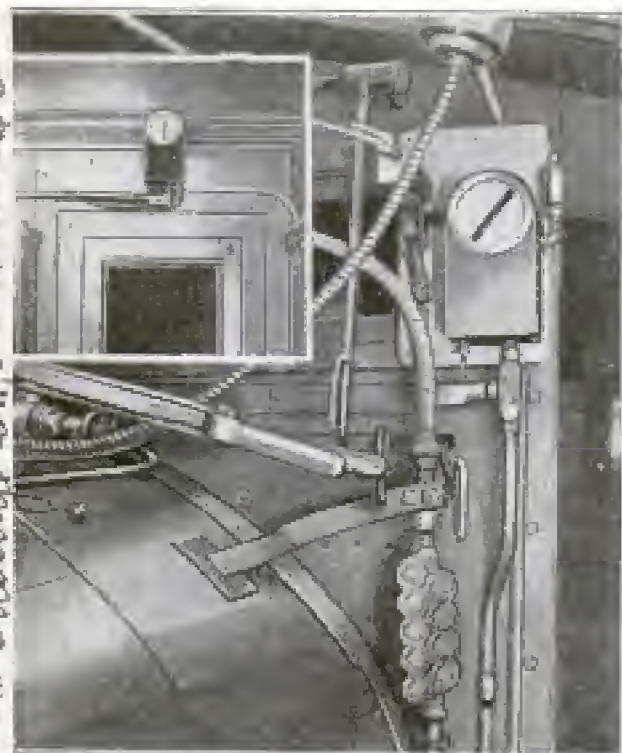
All the work done has been accomplished by the state alone. Federal funds, made available by the Industrial Rehabilitation Act of June 2, 1920, have not been utilized up to this time. When they are, it will mean an expansion of the work. The bureau has branch offices in several

cities of the state, and sends out circulars to get in touch with disabled men through labor unions and other organizations, in order that no one entitled to its services may be overlooked.

"As industrial plants have, in the past, maintained salvage departments for the elimination of needless waste of mechanical equipment, and studied the development of by-products until their value in some cases exceeds the value of the original product," says Mr. Riddle, "so must attention today be given to the human by-products of hazardous industrial processes. It is essentially a problem of human engineering."

ELECTRIC SIGNAL FOR EITHER FREIGHT OR PASSENGER TRAIN

An electric train signal that has many advantages over the existing system, and that can be applied to freight as well as passenger trains, has been under test for



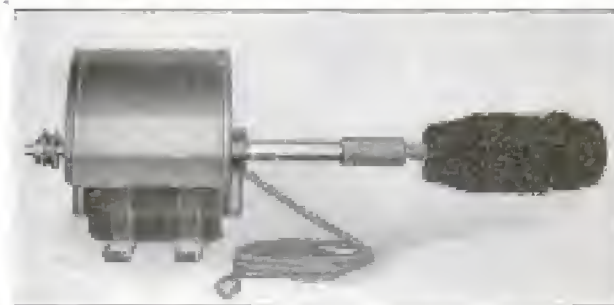
New Electric Train Signal Shown Installed on the Cab of a Locomotive, and in the Inset, on a Somewhat Smaller Scale, Shown in a Passenger Coach

more than a year on a train making a daily run in New York and Vermont. In each coach of a passenger train, and in the cab of the locomotive, a signaling instrument is installed so that it is plainly visible. It is in the form of a small metal case with a framed dial on which is pivoted a miniature semaphore that swings from a vertical to a horizontal or sloping

position to indicate danger, like the ordinary outside signaling semaphores. Attached to the case in each coach is a small hissing device, and to the instrument in the locomotive cab a loud whistle, all of which are operated by the brake air. The operation of these signals depends upon an electric circuit, the interruption of which causes instantaneously the blowing of the whistle, and the swinging of the semaphores in every instrument. Small batteries are required on freight trains, but would not be needed on electrically lighted cars. The wiring is connected between the cars by means of an insulated-wire coupling in the brake hose, thus making necessary only two hose couplings instead of three on passenger trains. An interruption of the electric circuit can be caused at will, and is caused automatically by any accident.

BOTTLES AND GLASSES WASHED BY USING BRUSH AND MOTOR

An electric bottle washer is available, which consists of a brush mounted on a



The Electric Bottle Washer, Showing the Motor with Long-Handled Brush: The Cord Attachment can Also be Seen

handle attached to the shaft of a $\frac{1}{8}$ -hp. motor. The device is placed so that the brush extends over a tub of water in which the bottles are placed. These are

*Electric Specialty Co.
Stamford, Conn.*

U. S. Train Signal Co.
97
in charge H. Portland (Conn.)

9670

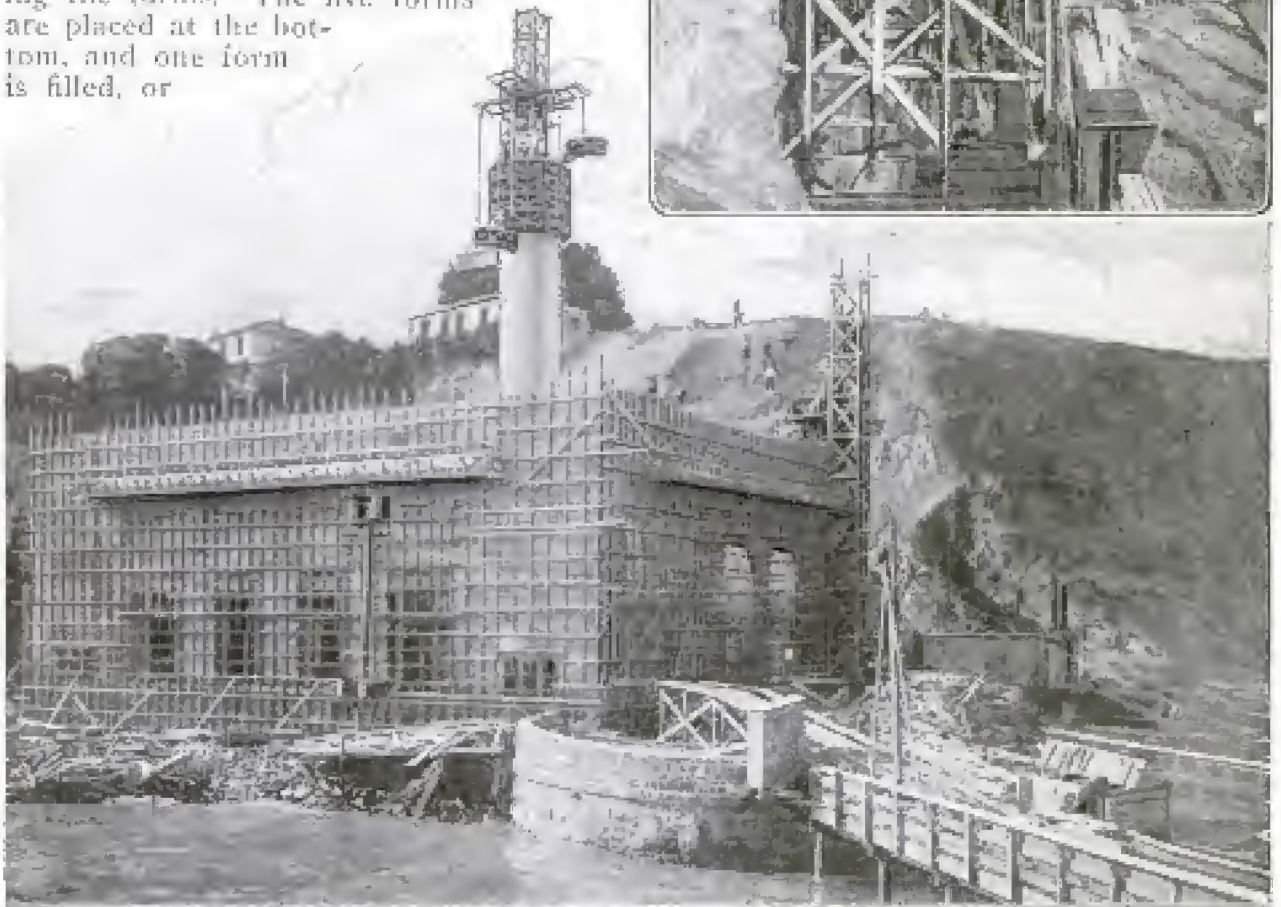
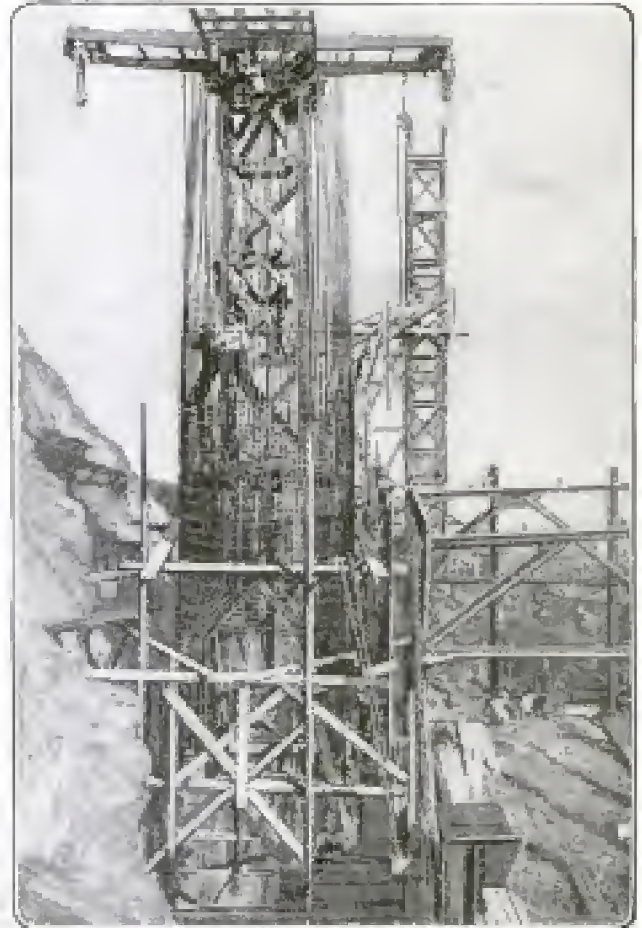
half filled with water, and pushed over the swiftly rotating brush. After cleaning, the water is poured out and the brush then acts as a drier. The motor shaft can be fitted with different-sized brushes, or with wheels to be used as buffers for silverware or other household utensils.

7534

CONCRETE CHIMNEYS ERECTED WITH GREAT RAPIDITY

Speed in construction is always considered a great asset, and a new way of building concrete chimneys certainly comes under this head. Concrete, as is generally known, requires a certain length of time after being poured to become hard, or set as it is called, and on work of this nature there is always a necessary wait before the form, or mold, is removed. To overcome this delay, a contractor has used five forms instead of one, each form being divided into four parts. When a chimney is to be erected, a wooden tower is first built, in what will be the center of the stack. This tower supports four sets of block and tackle at the top, for the purpose of hoisting the forms. The five forms are placed at the bottom, and one form is filled, or

poured, every day. On the fifth day, the lower form is hoisted to the top of the others, and again filled. Each day, thereafter, a form is raised, so that the work is never halted, and yet each form has four days in which to set, or harden.



A Concrete Chimney during Construction, with the Sections of the Lower Form being Hoisted to the Top Position by Means of a Block-and-Tackle Arrangement Mounted on a Tower in the Center of the Chimney: The Upper View Shows the Method of Placing the Reinforcing Steel

Reynolds View Co., 91 - 7th Ave.
New York City.

7624
d w. Walter A. Richmond
Egg Harbor N. J.

38

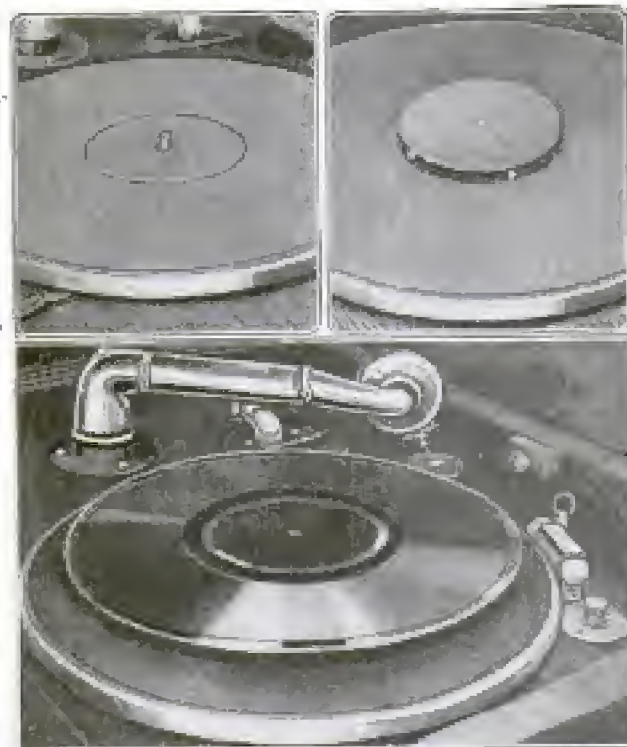
POPULAR

MECHANICS

Journal of Franklin Institute
Nov. 1921

RECORD-LIFTING DISK LATEST PHONOGRAPH CONVENIENCE

For the convenience of phonograph users, an attachment has been invented to lift records from the turntable of the



Above: A Phonograph Turntable with the Lifting Device Raised, Right, and Lowered. Left: Below: Record Lifted from the Turntable by the Device

machine. The center of the turntable is made in the form of a separate disk, which can be raised by pressing a button and plunger. The plunger is connected with the center disk by means of a series of links. This lifts the record so that it is easily removed from the turntable. When using this device, it is not even necessary to stop the machine, as the record can easily be removed while the turntable is rotating.

7738 ELEPHANTS BOARD TRAIN AT PASSENGER STATION

Down the taxi drive of the Grand Central Station, New York City, filed four elephants one night not long ago. The excitement which their appearance created did not disturb the animals in the least. They went directly to their private car on the midnight train for Boston. Ordinarily elephants leaving the city en-train at the freight yards, but this 20-ton quartet, known as Tillie, Tony, Clara, and Pitt, could not complete their engagement at the show in time to make the train in the usual way, so a special ar-

range-ment was made for them. Two doorways, 7 ft. high, which had to be passed, caused no difficulty, though Tillie is 12 ft. tall. The animals merely knelt and crawled through without even breaking ranks.

ORDINARY CISTERN FILTERS

7732 DO NOT PURIFY WATER

According to the United States Geological Survey most of the filtering methods, used to purify cistern water for drinking purposes, do not remove the disease germs, though they do make the water apparently clear. The most common method is to divide the cistern into two compartments by a brick wall. Water is admitted to one compartment and drawn from the other after it has filtered through the wall. This improves its clearness, but not its sanitary qualities. When properly purified, cistern water can be used for drinking purposes with entire safety.

7653 X-RAY PHOTOS ARE MAGNIFIED WITH NEW DENTAL APPLIANCE

Magnification of the Roentgenographs, or X-ray photos, of the teeth, to the extent of several times, is made possible with the use of a new dental appliance. The magnifier is electrically lighted and can be attached to any light socket in the usual manner. When an X-ray picture of the teeth is taken, it is sometimes impossible to detect with the naked eye the minute abscesses, or pus pockets, which have formed at the roots. Thus



The X-Ray Photo Magnifier, Showing the Photo before being Magnified, at the Left, and at the Right, the Same Photo Magnified

the value of this instrument for dental diagnosis is very apparent, and it should prove a popular aid to this profession. The instrument can be adjusted to the proper focus for any person by means of a small thumbscrew.

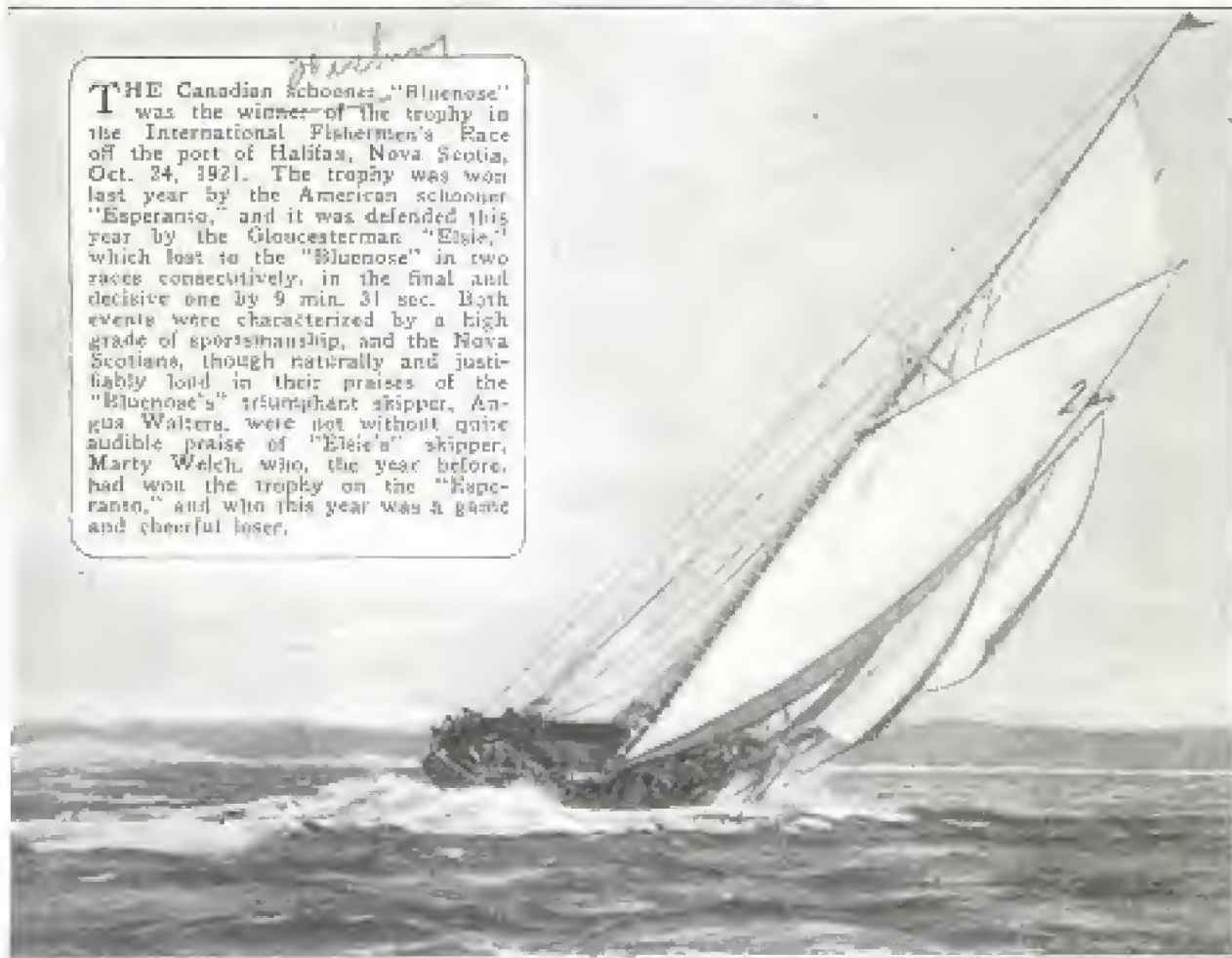
New York Edison Co.
W. 42 no 1. N. Y. C.

New York Times
Jan 21 1922

CANADA WINS IN GREAT MARINE SPORTING EVENT

prisoner

THE Canadian schooner, "Bluenose," was the winner of the trophy in the International Fishermen's Race off the port of Halifax, Nova Scotia, Oct. 24, 1921. The trophy was won last year by the American schooner "Esperanza," and it was defended this year by the Gloucesterman "Elsie," which lost to the "Bluenose" in two races consecutively, in the final and decisive one by 9 min. 31 sec. Both events were characterized by a high grade of sportsmanship, and the Nova Scotians, though naturally and justifiably loud in their praises of the "Bluenose's" triumphant skipper, Angus Walters, were not without quite audible praise of "Elsie's" skipper, Marty Welch, who, the year before, had won the trophy on the "Esperanza," and who this year was a game and cheerful loser.

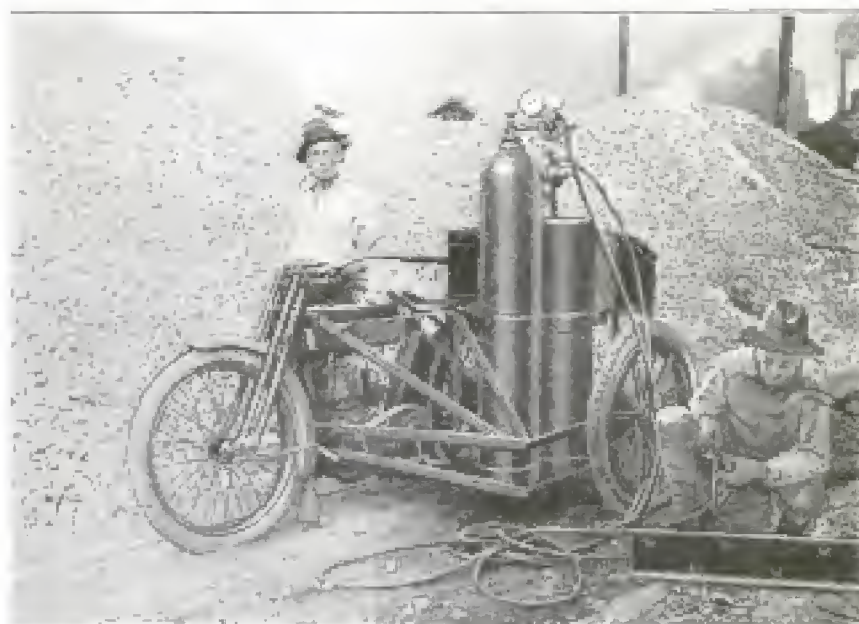


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7556 WELDING OUTFIT ON MOTORCYCLE

Operation costs of a welding outfit have been lowered one-half by mounting the apparatus upon a motorcycle with an improvised frame and a third wheel. The improvement is the result of the efforts of a street-railway company to obtain a welding outfit that could be moved from place to place more quickly and at less expense than was possible with the motor truck then in use. The officials of the company declare that the change has proved very beneficial, and could be profitably utilized to do similar welding for any company. The great adaptability of this small, though efficient, equipment in carrying the welding outfit

to many places that are inaccessible to a motor truck, is very apparent.



The Motorcycle Welding Outfit, Showing the Method of Carrying the Equipment, the Use of Which Requires a Driver and a Welding Mechanic

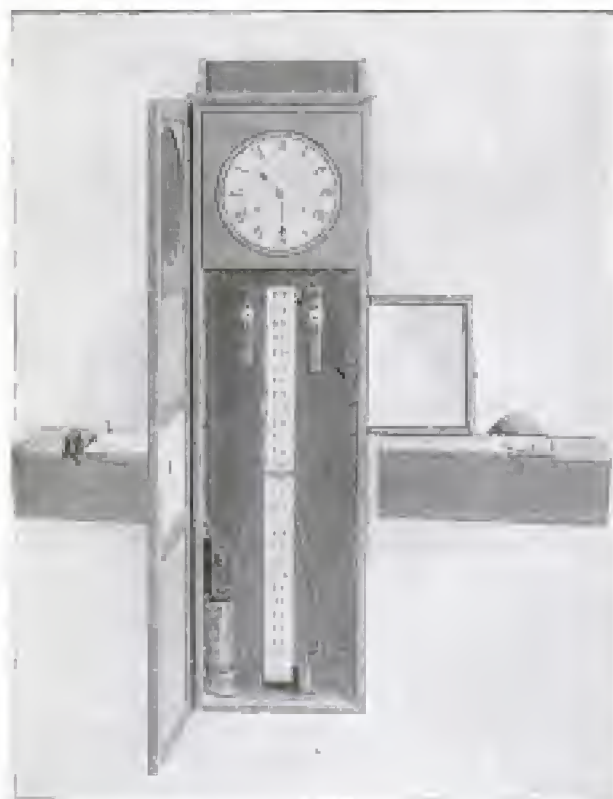
Emil John J. Peraty Co. 1010 W. Maple St. Chicago

Used - New Orleans Railway Light Co.

J. A. Llewellyn, d. w. C. A. Briggs
 Oberlin Conservatory of Music 1521 Oak St.

40
 7615 Oberlin, Ohio
POPULAR MECHANICS
SYSTEM OF SYMBOLS USED
IN "UNBEATABLE" CLOCK

Time clocks are usually a source of more or less trouble to the employer, because after the clock is installed, some



The Time Clock, Showing the Arrangement of Letter Symbols Operated by Electricity. Left Shelf: The "On Time" Register. Right Shelf: The "Late" Register

one has to be detailed to watch the employees using it, to detect any false registrations. As a means of preventing the workers from registering for each other, or from covering up "late marks," an Oberlin, Ohio, inventor has produced a new clock. Instead of complicated machinery, he uses a system of symbols, composed of letters, to compel every employe to make a correct report of his

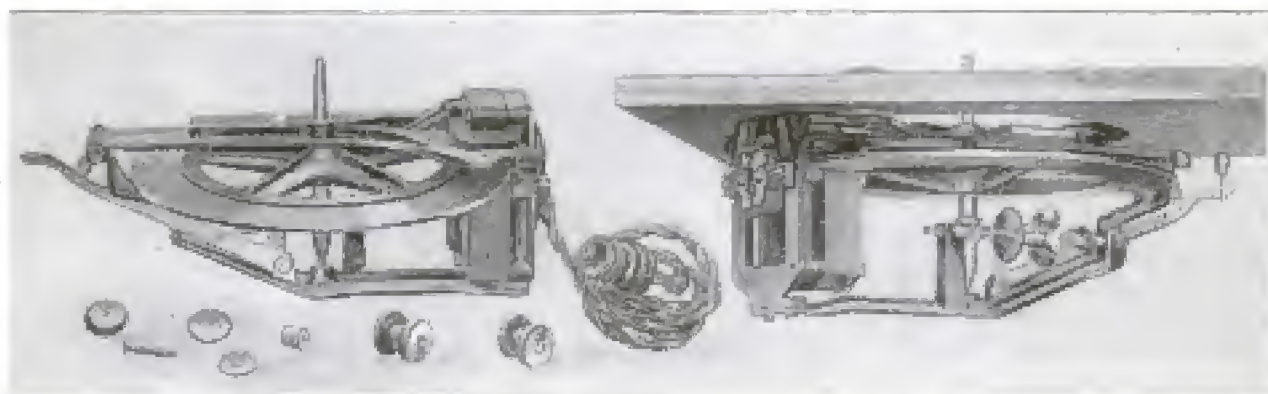
arrival or departure. These symbols have a different combination for every two minutes of the 24 hours. By simply pressing a button, the employe has the time and corresponding symbol stamped on his time record, after which he is required to sign his name. It is claimed that the clock can be used to advantage in any line of work, or for automatic roll calls of any description.

7213
EARTHQUAKES FROM DEEP
REGIONS OF THE EARTH

Earthquake waves may originate at points in the earth a considerable distance below the surface, according to the recent announcement of a scientist who has studied the existing data on the subject, and subjected it to elaborate mathematical analysis. Previously it has been assumed that such disturbances came from so near the surface that the effects of their depth could be neglected in considering problems of earth-wave propagation. It appears that the origin of some waves may be as far below the surface of the earth as one-fifth of its radius, or roughly one thousand miles, and it will be necessary to modify the interpretation which has been placed upon many of the earth's disturbances, and this may exercise an important influence upon our ideas of the stability of the earth and of its past history.

7217
ELECTRIC PHONOGRAPH MOTOR
OF SIMPLE CONSTRUCTION

A new phonograph motor of extremely simple construction, and said to possess numerous good qualities, has been built along the lines of the watt-hour meter, which is installed in every electrically lighted home. Only two moving parts are used, thus assuring few breakdowns



Left: The Phonograph Motor, Showing Its Simple Construction and Few Details Needed to Attach It to Any Machine. The Similarity to the Ordinary House Watt-Hour Meter can be Seen in the Flat Copper Ring Which Rotates through a Magnetic Field. Right: The Motor Attached to an Instrument

General Electric Co., Schenectady, N. Y.

Dr. J. A. Plummer
Berlin Conservatory of Music
POPULAR MECHANICS
Berlin, Ohio

Woodworth Electric Co.

7652

ELECTRIC "NIGHTCAPS" USED FOR WARMING COLD HEADS

Bald-headed men can now sleep in comfort, regardless of any chilly blasts of winter which may sweep in through open



Left: How the Cap Appears on the Head. Right: The Inside of the Cap, and the Plug and Cord

windows or along open sleeping porches. The answer to the perplexing problem of cold-headed persons, lies in the production of an electrically heated warming cap. This cap is made in much the same manner as the common warming pads and blankets now on the market, and has the usual plug attachment.

6492

MOTORCYCLE TRANSFORMED INTO AUTO BOBSELED

An auto bobsled which derives its locomotion from a motorcycle engine and has a body line similar to that of a motor car, has been developed by an enterprising Indiana cyclist. The rear wheel of the motorcycle and the engine remain fitted to the cycle frame, and this in turn is fitted to the frame of the bobsled. A standard automobile wheel is used in steering, and the driving wheel is equipped with chains to prevent slipping.



The Engine and Rear Wheel of a Motorcycle, Both Still Attached to the Cycle Frame, Form the Driving Equipment of This Auto Bobsled. The Wheel is Provided with Chains

Harley Davidson Motor Co. Milwaukee, Wis.

and a corresponding longer life. The rotating element consists of a copper ring of 9-in. outside diameter and 6-in. inside diameter, having a thickness of approximately $\frac{1}{4}$ in. This ring revolves through the ordinary electromagnetic field. It is claimed that the motor has a small power consumption due to the way its bearings are placed.

AUTO-GLARE DIMMER TO END DANGER FROM HEADLIGHTS

Laws have failed to end the dangerous glare of auto headlights, but their danger is eliminated by a screen which can be instantly slipped onto the windshield of any machine. It consists of a spring-brass frame holding a very fine-meshed



The Driver does Not Look through the Dimmer, He Looks under It. Its Shadow on His Eyes Protects Them from the Glare. Right: The Dimmer Alone

woven screening of a special-bronze wire. A slide and thumb screws provide the adjustment for height. When not needed, it is turned up, but can be lowered by a mere touch.

PRIZE AWARDED DISCOVERER OF HARMLESS OPIATE

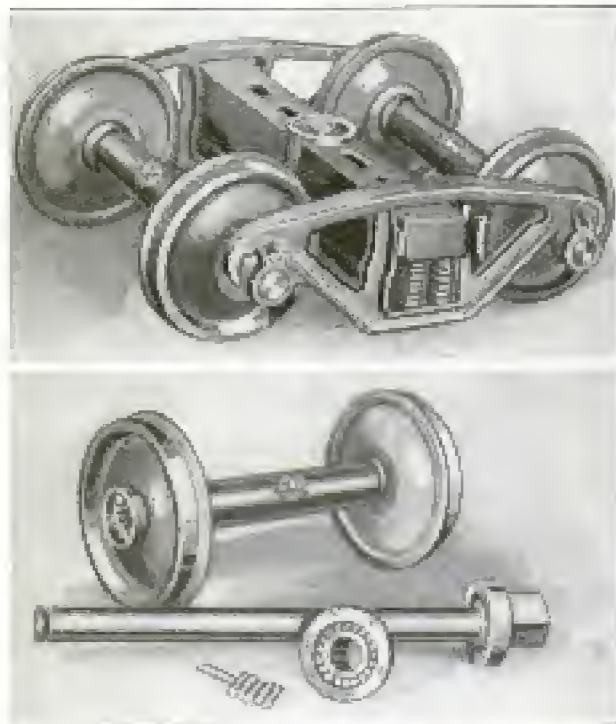
To enable Prof. David I. Macht, of Johns Hopkins University, Baltimore, Md., to continue his research work on certain synthetic compounds which are successfully replacing opium as sedatives, the American Pharmaceutical Association has awarded him the annual grant of the association's research fund. The compounds, known as "benzyl derivatives," were first tested on animals five years ago, and their use has already saved thousands of convalescents and invalids from becoming possible drug addicts. They are fully as effective as opium derivatives, but do not form a craving or habit, such as may result from the medicinal use of opiates. The new investigations will be of benzyl compounds found in certain vegetable preparations.

New York Times
 10/17/21 P. 32

Ray & Carter Co., Quarim, Ind.

Cochran Roller & Ball
Bearing Axle Co., 12 1/2 S. South St.
 42 POPULAR MECHANICS
 7442 Mr. Vernon, Ill.
 ROLLER-BEARING AXLES
 ON RAILROAD CARS

A roller and ball-bearing axle for street and railway cars has been under test now for nearly two years on a railroad car



Railroad-Car Truck with Roller and Ball-Bearing Axles: The Rollers Are between the Axles and the Inclosing Sleeve That is Filled with Lubricating Grease through the Hole at the Center

with, it is said, very satisfactory results. Each journal of the stationary axle is hardened to form the inner race for a series of rollers, the outer race for which is a cylindrical extension of a rotating sleeve that incloses the axle between the wheels, and which is kept full of grease for lubricating both bearings. These rollers are directly in line with the thrust from the load on the wheels, and there is no eccentric stress as in ordinary journal boxes. All side thrust on the axle is taken up by ball bearings, which are outside the axle sleeve and contained in a cap at each end of the axle.

7744 MAKING PHONOGRAPH RECORDS
 OF ACTUAL GRAND OPERA

Phonograph records of operatic or other singing are now made by requiring the performer, or performers, to sing into a gaping horn, standing just at the right distance, and being painfully careful just how the voice is aimed. When the recording apparatus has once been started no sound can be made by anyone but the singer, and all instructions from the director have to be made by gestures and

signs. Thus, besides the unnerving effect of the gaping horn, the singer has to keep his eye on the director, who gesticulates from behind the recorder. This is, to say the least, not exactly a stimulating form of inspiration for the singer. But, on the other hand, could these records be made when a singer is in his, or her, field of glory on the center of the operatic, or concert, stage, facing an admiring audience, surrounded by sympathetic colleagues, how much better would be the result! Plans are now under way to make records in this manner; indeed some have already been made in Chicago, where recently, for several nights, grand-opera performances have been radiophoned, to the inexpressible delight of thousands of wireless amateurs located in districts hundreds of miles away from the Chicago opera house. The records are first made, as usual, on wax master records, and everything is conventional excepting the one prime and highly important fact that the artistic temperament of the performer is not being tampered with. In connection with the enterprise there is, however, one mechanical novelty which has not yet been used in taking these operatic records. This is an entirely new form of listening device, the instrument that receives and transmits the sounds from the stage or auditorium. It is expected that it will make possible a reproduction of music on the phonograph that will surpass anything that has yet been done.

7651 ADJUSTABLE DESK TRAY NEW
 OFFICE CONVENIENCE

Adjustable desk trays with a mounting which can be either screwed to the desk or clamped on, without marring the surface, are now on the market. The mounting consists of a grooved rod, about which the trays revolve, and the screw plate or clamp. Trays can be ad-



justed instantly to any position desired or swung entirely out of the way. They are regularly made in units of two, three, and four trays. Each tray can be removed from the rod separately.

American Electric Co.
State & 64th Sts. Chicago.

AUTO TRAILER DESIGNED TO TRANSPORT HORSES



APR 25, 1914, 1914.

Above: The Horse Trailer Loaded and Coupled to a Motor Car, Ready to Start on a Cross-Country Trip. Note the Ventilators in the Top.

For the purpose of transporting horses to and from races and horse shows, without the bad effects of railroad travel, an English firm is making a new kind of automobile trailer. It consists of a box body, just large enough for a horse to stand in, mounted on two pneumatic-tired wheels and covered by canvas stretched over a frame. Each end of

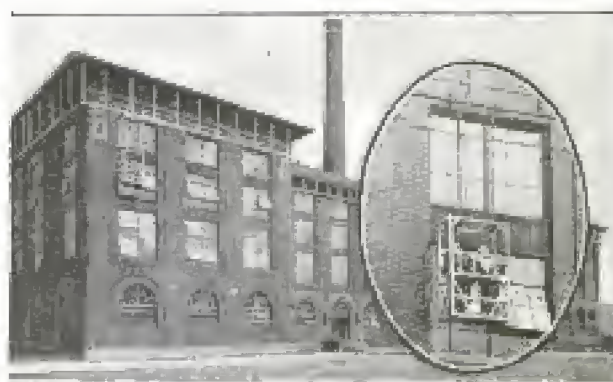


Left: The Legs Used to Support the Trailer When Standing are Shown in Use. Also the Coupling Device for Hooking to a Car can be Seen.

the box is hinged at the bottom and drops to form a platform by which the horse enters the box. Iron legs, at the ends of the box, are lowered to support it while standing, and are raised when the trailer is coupled to the rear of a motor car for traveling. Ventilation is provided by two openings in each side of the canvas top and through the ends.

TRAM SYSTEM INSTALLED FOR WASHING WINDOWS

Washing the 4,600 window panes of the new Division Street pumping station of the Cleveland, Ohio, waterworks, has been made a safe job which can be done in a comparatively short time, by the installation of a tram system. A rail, around the building just below the roof, supports a light hand-propelled cage which can be raised or lowered by means of two small hand winches. The rail is inconspicuously constructed and does not detract from the appearance of the build-



Just below the Roof Is the Rail from Which the Window-Washing Cage is Hung. The Insert Shows How the Cage is Suspended.

Cleveland Crane & Engineering Co.
Wickliffe, Ohio.

Cmt. C. A. Briggs
1521 Oak St., N.W.
Washington
D.C.
7204

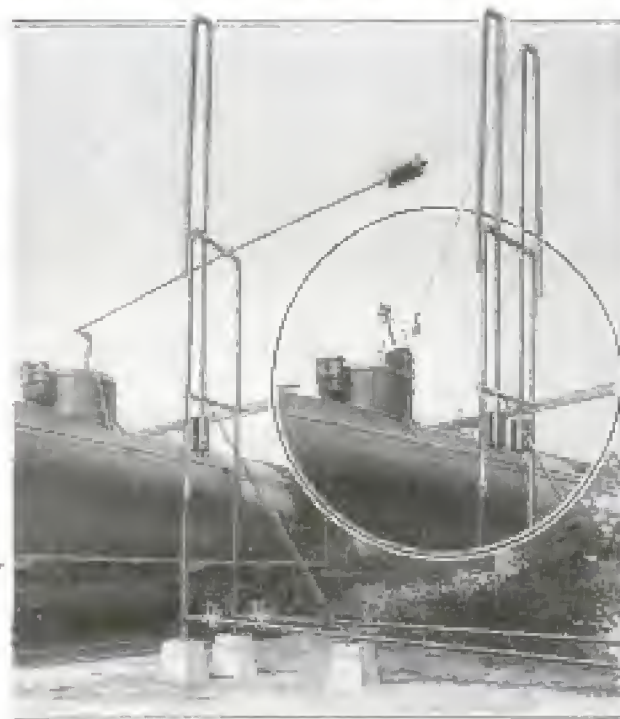
VITAMINES UNNECESSARY FOR PLANT-GROWTH

While it appears impossible to maintain animal life without vitamins, they are not necessary for plant growth, according to the report of a French investigator. He found that plants would reach complete growth in media known to be free of vitamins, or which were entirely of mineral composition. On the other hand, vitamins were found to be of assistance in plant growth in some cases where the plant was placed in a soil of low nutritive value, but the vitamins can be replaced perfectly by the addition of appropriate mineral salts.

7537

TANK CARS QUICKLY EMPTIED WITH NEW UNLOADING RACK

Transferring the contents of oil-tank cars to storage reservoirs, has been greatly speeded up by the introduction of a new unloading rack. The rack is constructed of 2-in. steel pipe, and is fitted with universal joints and counterweights, which make the unloading, or tank-feed, pipe, very easy to handle. The entire arrangement is controlled by a chain in the hands of an operator on the tank car, and when not in use, the counterweights cause it to lock automatically, in a vertical position. Thus the rack, when idle, is always clear of the track, which prevents any chance of accidents.



The Unloading Rack as It Appears in Use; Insert Shows the Idle Rack before being Pulled Down

Cmt. L. L. Jellison, 250 G
Windsor Ave., Lubbock, Texas.
Copyrighted Material

ing. Using this system, a great saving is effected in the time and cost of window washing. The tram can also be used for painting the window frames and spouting, replacing broken panes, or making any light exterior repairs.

IMPROVED TRAFFIC TOWERS FOR DETROIT SYSTEM

New and improved traffic-control towers will replace those which are being used in Detroit, Mich. The system, de-



With Traffic Towers like This, It Is Only Necessary to Have a Traffic Officer Every Four Blocks to Get Perfect Traffic Control

scribed in Popular Mechanics for June, has been so successful that it will be developed still further. The new towers are more artistic in appearance than the old ones and are equipped with a double set of lights. A telephone system has been added, and megaphones protrude through the floor of the traffic officer's box, by means of which he can give verbal directions whenever it is necessary. These towers will be used to control the traffic for four blocks in each direction, by means of three lights. A green light signals to go ahead, a red to stop, and a yellow one warns that traffic is about to be stopped.

Cmt. W. R. Croson,
4429 Townsend Ave., Detroit
Mich.

precipitated
carbo

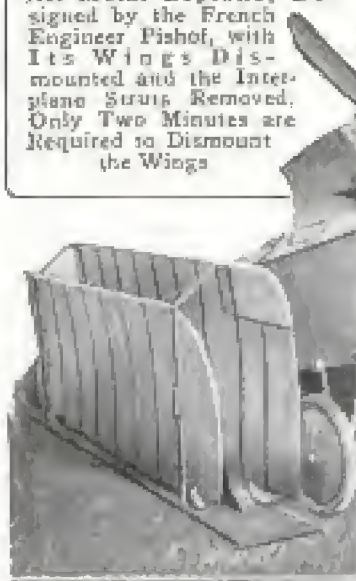
Cont. No. 4, Rue Richer
Paris, France

7593

POPULAR MECHANICS

Bueller-M. de Pishof, 3 Rue

Below is seen the New All-Metal Biplane, Designed by the French Engineer Pishof, with Its Wings Dismounted and the Interplane Struts Removed. Only Two Minutes are Required to Dismount the Wings



The Front View of the Plane, at the Right, Shows How the Little 20-Horsepower Six-Cylinder Anzani Motor is Mounted, as Well as the System of Interplane Bracing by Means of I-Form Struts and Wires

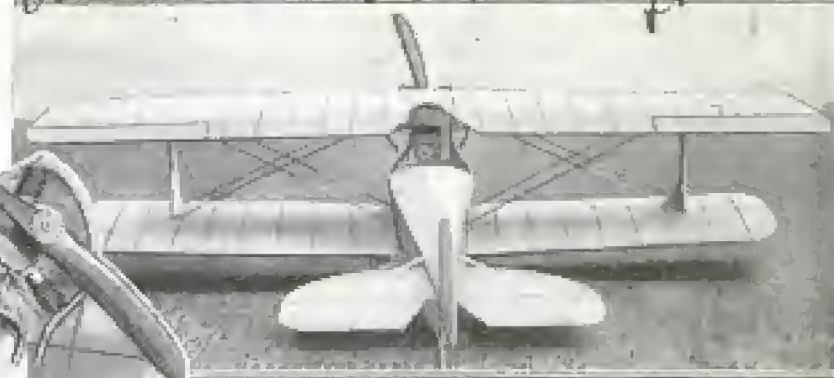
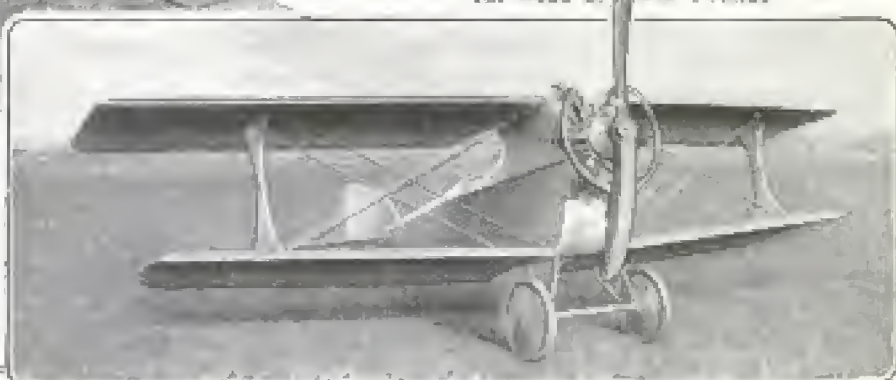


PHOTO COPYRIGHT, H. B. C.

This Small Machine is Designed to Require a Minimum of Housing, Occupying a Space Only 19 Feet Wide, 13 Feet Long, and 5 Feet 3 Inches High When Completely Assembled. With the Wings Dismounted, It Requires Even Less Space. It Weighs 418 Pounds and Has a Useful Load of 242 Pounds



SMALL FRENCH AIRPLANE HAS DEMOUNTABLE WINGS

Wings which can be demounted in two minutes are the conspicuous feature of the new French airplane, designed by Pishof, in developing a type of plane requiring only a small hangar space. This machine is a biplane with single I-form struts at each side of the fuselage and wire bracing. It has a span of 19 ft., is 13 ft. long, and 5 ft. 3 in. high. The construction is of the all-metal type and a 20-hp. six-cylinder Anzani motor furnishes the power. Empty, the machine weighs 418 lb., and it has a useful load of 242 lb. It is credited with a speed of about 70 miles an hour.

7664

ELECTRIC RANGE HAS SWITCH WITH TWO PILOT LAMPS

Pilot lamps in a main-line switch are a new feature of electric ranges, and one which should be popular with the forgetful housewife who neglects to turn off the current. The main switch box is designed to be mounted in, or on, the wall near the stove, and contains two pilot lamps which are connected across the load side of the switch. A small knob

to operate the switch, and red lenses in front of the lamps, are set in the face of the box. When the switch is turned on, the lamps light behind their red reflectors, thus serving as a vivid reminder that the current is being used.



The Woman is Turning the Switch Handle, above Which can be Seen the Two Pilot Lamps Mounted in the Switch-Box Cover

Electrical Mfg. Co.

4149 E.

7976 St. Cleveland, Ohio

demountable coverlet Paris, France.

THERMOELECTRIC PYROMETER

HAS SELF-COMPENSATION

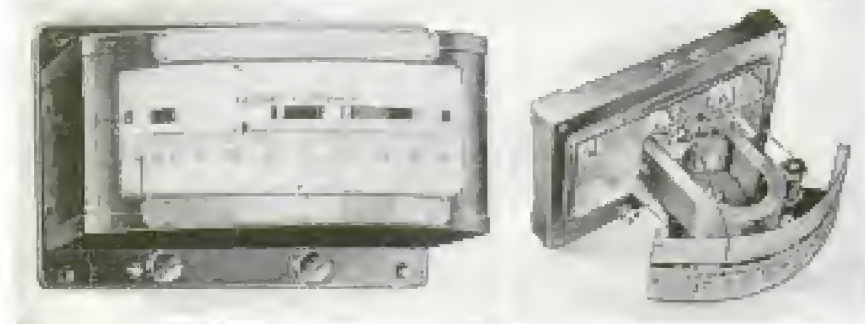
Pyrometers are used to measure exceedingly high temperatures, such as molten metals, high-pressure steam, etc.

STUDIES OF PIPE CORROSION BY BUREAU OF STANDARDS

Underground-pipe systems always suffer more or less rapid deterioration as a result of the corrosive nature of the soil,

and much study has been devoted to the problem of overcoming the trouble. Now the Bureau of Standards has taken up the subject and is making investigations, particularly with reference to gas and water mains. Forty locations representing different kinds of soils have been selected, and at each of them samples of standard iron and steel pipes will be buried.

These will be uncovered periodically to find the rate of corrosion. When all the necessary data have been obtained, extensive laboratory tests and experiments will be made to discover a remedy.



Two Views of the Thermoelectric Pyrometer Which Has Automatic Compensation for Temperature Changes of the Cold Junction: At the Left is Shown an Exterior View of the Instrument, and at the Right the Interior

Thermoelectric pyrometers have two fine wires of different metals, which are fused together at one end and called a couple. This couple is then placed in the heat to be measured. The other ends of the wires are connected through a galvanometer. The difference in temperature between the couple and the outer ends, generates an electromotive force which is approximately proportional to the difference in temperature between the heat measured and the surrounding atmosphere. The cold ends of the couple have to be kept free from any temperature changes. Heretofore they have been brought to a compensating box to insure an even temperature. By using an improved-type instrument, these ends are connected direct, and any temperature change is compensated by an adjustment on the instrument.

FITTING TRIBUTE IS PAID BY AMERICAN LEGION POST

The Jeff Feigl Post of the American Legion has paid a fitting tribute to the man after whom the post is named, and who was the first New York officer to be killed in the late war. A bas-relief portrait, which shows him in uniform, has been made in bronze, and was recently presented to the Victory Hall Association, New York City.

Popular Mechanics Magazine does not publish the name of the maker or seller of any device described in its pages, but this information is kept on file and will be furnished, free, by addressing our Bureau of Information.

SHIP CARRIES A TRAFFIC OFFICER ON BOWSPRIT

Everyone is familiar with the small figures which often decorate the radiator caps of automobiles, but who ever heard of such a thing on an ocean-going ship? Still when the schooner "William Bowden," with a cargo of lumber from Westport, Ore., reached the port of Honolulu, H. I., one of these tiny figures, a traffic policeman, was seen perched on the end of its bowsprit. Throughout the 30-day trip he had stood there, turning and swinging his arms in response to every wind.

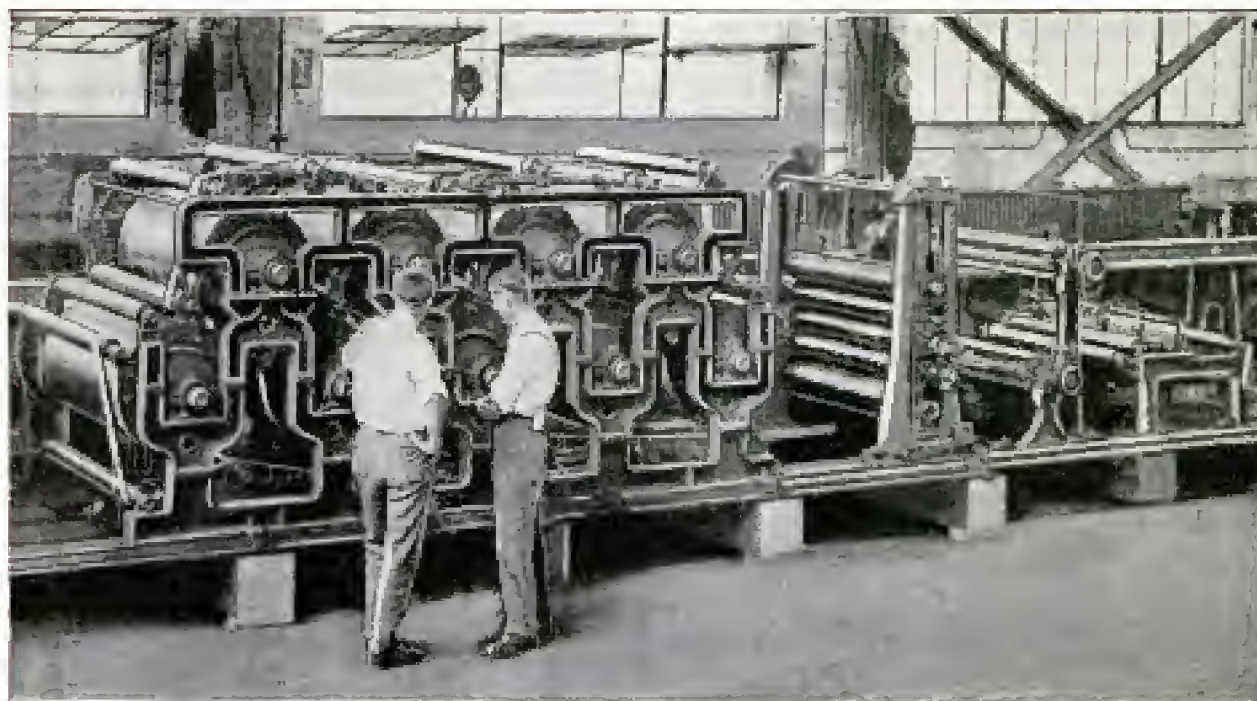


Standing on the Tip of a Schooner's Bowsprit, This Tiny Traffic Officer, with Swinging Arms, Responds to All the Winds of the Pacific

According to the crew, he was kept busy day and night, though the traffic on the Pacific Ocean has never been congested.

Emb. R. Clutterbuck
Box 1116, Honolulu, T. H.

International Photo Service, New York City
226 William St., New York City



Part of the Small Paper Mill Built in This Country for the Siamese Government: It has been Shipped to Bangkok, Where It will be Installed for Experimental Work, as the First Step toward Developing the Paper-Making Industry in That Country, Which Is Exceedingly Rich in Raw Materials

MINIATURE PAPER MILL SAID TO BE MOST-COMPLETE BUILT

An American-built paper mill, shipped to the Siamese government for experimental purposes, is one of the most complete mills ever built. Though of small size, being only 56 ft. long, it is equipped for the manufacture of all kinds of writing and printing papers, and is patterned after the experimental mill of the U. S. Bureau of Standards. The shipment includes such essential parts as a Fourdrier sieve, 43 in. wide and 33 ft. long, two 300-lb. wood-tube beaters, a small engine, a 600-lb. rotary beater, a cylinder duster, screen, sheet cutter, and bleaching plant, besides all fittings and accessories. Both constant and variable-speed shafts are provided. Siam became interested in the use of its abundant raw material through experiments, described in Popular Mechanics for December, made at the suggestion of their ambassador to the United States.

ELECTRIC-VALVE TUBE MADE WITH REVERSIBLE FEATURE

Electric-valve tubes are usually one-way affairs as regards the current flow, but a new tube is available which possesses a reversible feature. The innovation consists of a spherical glass bulb with two cylindrical ends, each containing a short terminal wire. Between the ends is placed an aluminum tube which is insulated

from the terminal wires by an air gap. Inside of the tube is a small aluminum ball. By tilting the tube to either side, the ball rolls down to the end, thus making contact with one or the other of the terminal wires by closing the air gap.

"FOOL-PROOF" SEAWALL BUILT WITH SHARP-EDGED TOP

Tourist bathers refused to consider the danger to their necks in diving off a seawall at Waikiki Beach, Honolulu, but strove to imitate the clever Hawaiian boys, who can dive in very shallow water. The beach authorities neglected this peril until a particularly enthusiastic "thrill hunter" banged his head upon the hard bottom with such force that his neck was broken. Signs were immediately posted to warn other rash divers, but the wall continued to be used for a diving-off place. Finally a sharp triangular concrete top was put on the wall, and this stopped the dangerous practice.



Showing the Seawall upon Which was Built the Sharp Triangular Top

Cont. A. Clutterbuck, Box 1115, Honolulu, T. H.

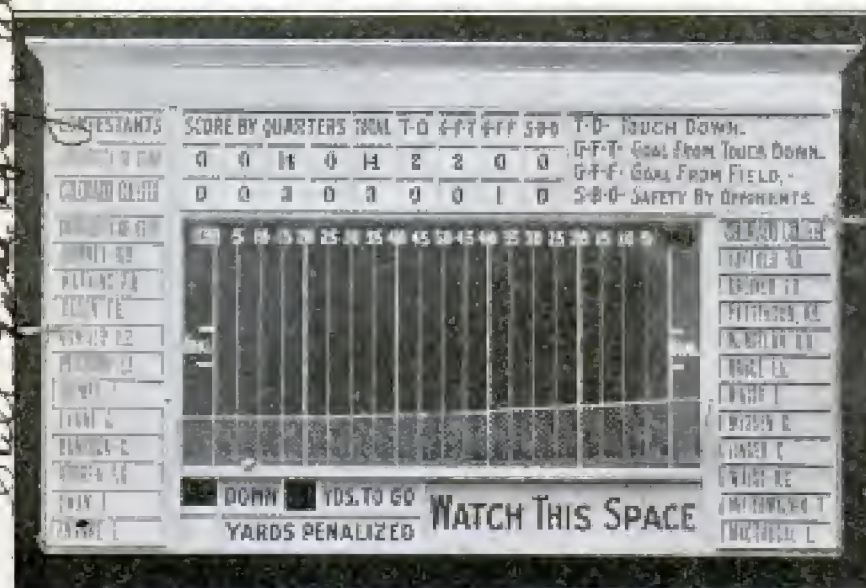
Electrical World
11/5/21

PROGRESS OF FOOTBALL GAMES REPRODUCED ON BULLETIN

University of Utah football games, played away from home, were reported to the fans who could not follow the team

this year, in a way that was almost as interesting as actually seeing the games. One of the Salt Lake City newspapers devised a bulletin board by means of which every move of the games could be reproduced. The board was a zinc plate,

marked off to represent a football field. An electromagnet behind the plate served to move a light metal ball about the field, as the plays were reported over a special telegraph wire. Sliding arrows indicated the team in possession of the ball and the player carrying it. Cards, slipped into slots, showed the score by quarters, the score made, the down and yards to gain, and penalties. A large slot, marked "Watch This Space," was used to display additional information, as when forward passes were made or intercepted, or the ball lost on a fumble.



The Special Bulletin Board, Which Enabled University of Utah Football Fans to Follow the Play of Their Team during Out-of-Town Games, Showed Each Action of the Games within a Few Seconds After It Occurred

ANCHORED BARGE IS BOON TO ANGLERS

Although deep-sea fishing has long been a popular all-year-round sport in southern California, satisfactory facilities have never been provided. Recently, however, the situation has been bettered by the anchoring of a barge about two miles off

Long Beach. Here poles and lines are provided, and one may fish to his heart's content. The barge contains some small staterooms, or cabins, and a dormitory with cots. There is also a kitchen and a cook to prepare the catch, if desired. Small launches run out from Long Beach at frequent intervals to transport the anglers who may wish to return to land.



One may spend the night in a comfortable stateroom or dormitory cot aboard this barge, which has been anchored two miles off the shore for the benefit of Long Beach, California, deep-sea fishermen, and be right on the spot for the early morning fishing.

Cml. Velpheia Phillips, 468-20th St.
San Pedro, Calif.



Some of the Residents of Point Barrow, Alaska, Greeting the First Ship on Its Arrival at Barrow, 12 Miles from Point Barrow Proper: The Woman at the Right, Carrying a Child, Is the Interpreter

BUILDING THE FARTHEST-NORTH HOSPITAL

BY LAWRENCE WILLIAM PEDROSE

*Hinchley Bldg.
Seattle Wash.*

THERE was completed recently at Point Barrow, Alaska, the farthest-north settlement on the American continent, a modern hospital with all the facilities of an up-to-date establishment of this type. Besides being the farthest-north hospital, it serves the largest area for an institution of its kind in the world—more than 60,000 square miles.

This hospital, costing \$35,000, will require \$16,000 a year to operate. The staff consists of a surgeon-physician, a trained nurse, one or two assistants, a housekeeper, and a janitor. Point Barrow and the immediate vicinity of the hospital have a population of nine white persons, including the surgeon and trained nurse, and about 450 Eskimos. In the territory which it serves, an area 200 by 300 miles in extent, there are some 400 or 450 more Eskimos.

The medium of contact between the white doctor and the Eskimos is the wife of an American resident, a native woman who acts as interpreter.

In constructing the hospital the forces of nature had to be overcome. The materials were purchased in the States, sent

to Nome by regular steamer, and transferred at the steamship terminal to small power schooners. Despite treacherous weather, which continued through the brief summer, the materials were delivered at Point Barrow the first week in September, 1920, so that the builders could get up the frame and inclose it before the snow came, and work on the interior during the cold winter weather.



After the Frost Set In, the Chimney had to be Completed with Steaming-Hot Mortar. It Was a Source of Wonder to the Eskimos

The main building is 38 by 70 ft., and the basement rests upon ice. Within the larger basement is a sub-basement, 16 by 40 ft., which houses two hot-air furnaces, electric-light plant, and stored supplies. The floors are of two thicknesses of 1 by 6-in. flooring, with a layer of tar paper

between. The roof consists of one layer of tar paper laid upon 1 by 6-in. tongue-and-groove lumber. Outside walls are constructed the same as the floor. The

the construction of the building is the windows. The original plan called for triple windows, to combat the cold, which ranges from 45° to 70° below zero in the winter time, but several sashes were broken in transportation, and there were left only two for each window. However, double windows serve effectually. Heat from the air furnaces is circulated by transoms over the interior doors.

The difficulties confronting the builders began when the materials were transshipped at Nome. The schooners carrying the freight became separated in a storm, and one was carried to the Siberian coast, where it lost its propeller in the ice. Twenty-four days were required to transport the materials from Nome to Point

Barrow. Fifty-five tons of coal were carried. Two hundred tons were needed, but so severe was the weather, the balance, 145 tons, was not delivered that year, and the hospital went through the first winter sorely short of coal. Because of the danger that the Arctic

Ocean might not open to navigation every summer, it is essential that two-years' supplies be carried on hand at all times.



The Point Barrow Hospital as It Appeared When Completed Last Summer: The Building, Constructed of Wood and Tar Paper, was Finished with Two Coats of White Marine Paint

interior is finished with wood-pulp building board. Salt water and beach sand were mixed with cement to make mortar for the brick chimney.

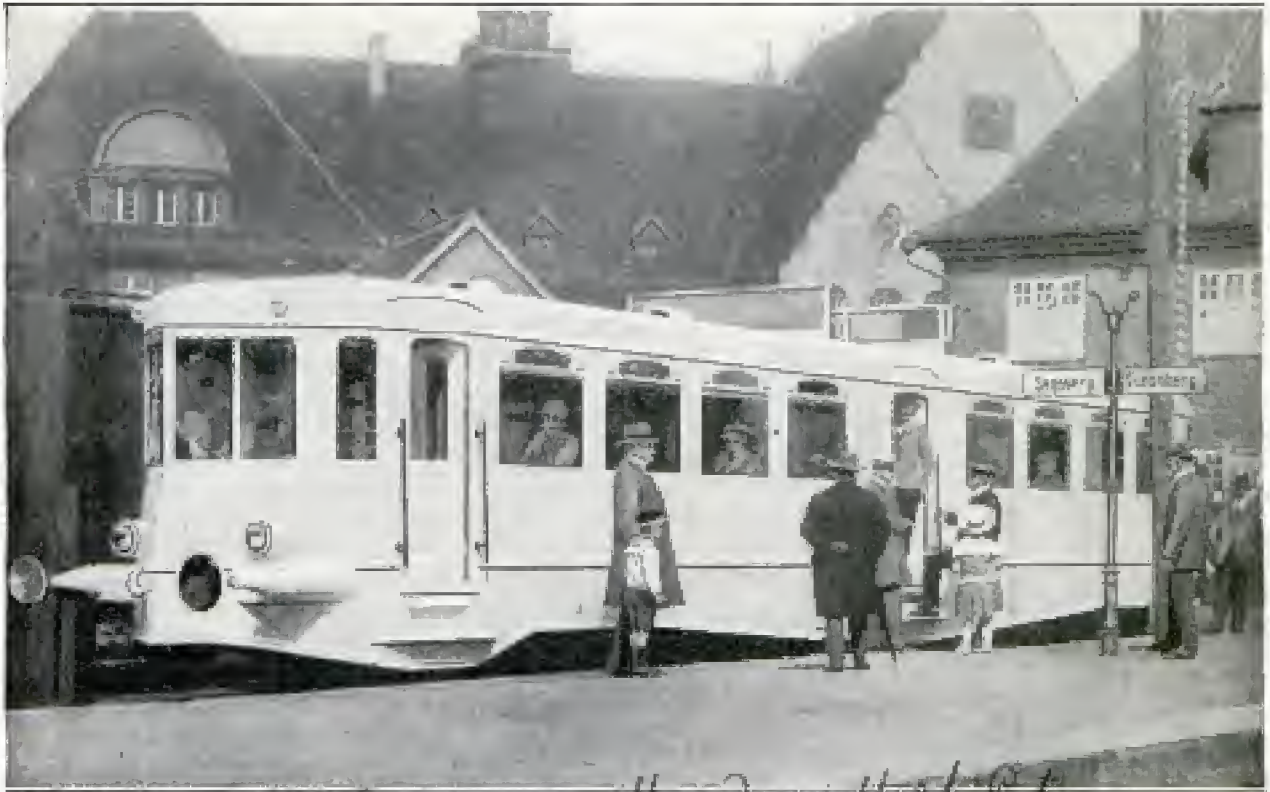
The building has at present 12 beds, with a capacity for 70 if required. It has a well-equipped dispensary, a complete up-to-date surgery, and maternity, tubercular, and general wards. During the four summer months, a cess-pool and modern plumbing facilities are used. Sterilized snow water is utilized at all times. An interesting feature of



Triple Sashes were Planned, but Many were Broken in Transportation, Leaving Only Two for Each Window



The Principal Buildings of Point Barrow, the Farthest-North Settlement in North America: At the Left Is the Church, in the Center the Mission School, and at the Right the New Hospital. The Two Nearest Modern Settlements Are 300 Miles to the South and 400 Miles to the East



COPYRIGHT, ADOLF A. BIERREY

153 E 42nd St. New York City
 One of the Street Cars Constructed from Discarded War Material: The Interior is Finished Complete in Every Detail and the Exterior Speaks for Itself. The Two Projections Seen on the Front of the Car Are "Bumpers," Which Is a Common Feature on European Street Cars and Railway Trains. The Headlights Are Directly above the Bumpers.

The foundation of the building was begun September 6. The chimney was started on the 12th. When the chimney was up 30 ft., frost set in, and it was necessary to build a bonfire around the mortar and use it steaming hot. The chimney, when completed, was a source of wonder to the Eskimos, but the electric-light plant struck them dumb with amazement and fear. However, when the natives learned the incandescent lamps were harmless, they took great delight in turning them off and on and examining various details of the plant. The hospital was completed last summer. It is planned to extend the electric-lighting system this winter to the principal houses.

All the difficulties of administering to the sick in the Point Barrow district have not been conquered by the completion of the hospital. Breaking down the prejudices of the natives is said to be difficult, for, like their white brothers, the Eskimos have a dread of the surgeon's instruments and will not take medicine unless it is disguised as a sweetmeat. Also, the native "medicine men" invoke the spirits to contest the power of the white man. However, modern science is gradually winning over the fears and superstitions of the Eskimos, and they are becoming more and more receptive to the aid which is being given them.

TANKS FROM GREAT WAR USED 7674 TO MAKE STREET CARS

The great Kiel plant in Germany, from which came so much of the war material, has now taken up more peaceable pursuits in the manufacture of street cars. These cars are made from the lumbering and rumbling tanks, and armored motor cars of all kinds, that carried explosives to the front, and which were ordered junked by the allies. They are driven by gasoline motors and are said to be complete in every detail.

MACHINE PERFORATES RAIL- ROAD TIES TO BE CREOSOTED

A machine, said to be the only one of its kind in the world, is used by a San Diego, Calif., lumber company for perforating railroad ties in connection with creosote treatment. The ties are fed into the machine between four studded steel rollers. Heavy springs press the studs into the ties, penetrating the wood about one inch on all sides. The ties are then dipped in creosote. The holes made by the studs allow the preservative to penetrate the wood more deeply than it otherwise would, and the life of the ties so treated is considerably longer than that of ordinary creosoted ties.

Char. R. McCormick
 Lumber Co. San Diego, Calif.

Cont. J. R. Schmidt,
3557 St Charles Place

POPULAR MECHANICS

Cincinnati Ohio

52
7539

LARGE LIONESS TREATED FOR ULCERATED TOOTH



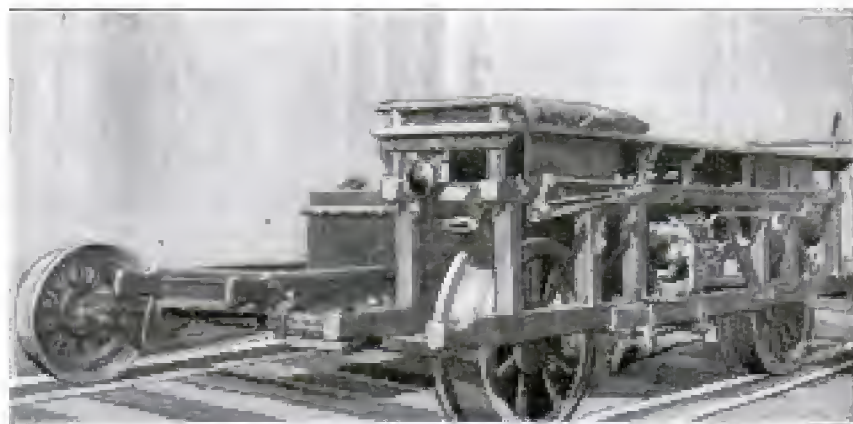
The Lioness Held against the Bars by the Wooden Partition: One Man Holds Her Mouth Open and the Other Injects the Medicine

One of the teeth of a large African lioness at the Cincinnati Zoölogical Gardens became ulcerated recently, and the animal refused to eat even juicy beef-steaks that were placed before her, until the painful tooth was treated. For treatment, the lioness was induced to enter a small cage next to hers, which had a wooden partition in it that could be pulled forward with ropes. The animal was then drawn up close to the front of the cage, and several iron rods were thrust around her and into holes in the partition, thus holding her helpless while the offending tooth was treated.

HIGH-SPEED HANDCAR BUILT BY SECTION FOREMAN

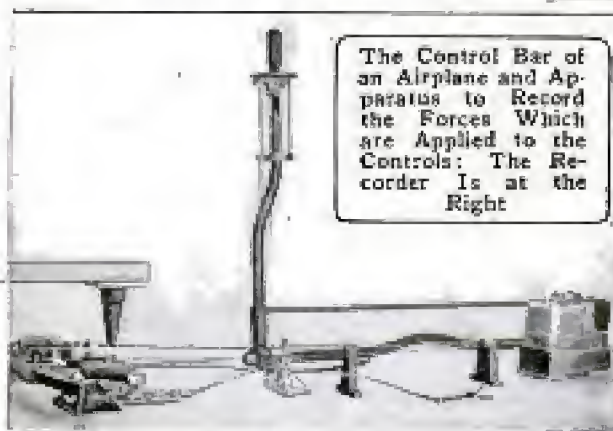
A motor-driven handcar of unusual construction has been placed in service by an Iowa section foreman. Being dissatisfied with the handcar supplied by the railroad, he decided to make one after his own ideas. A twin-cylinder motorcycle engine was used, and a three-speed transmission fitted to it. The engine is started with the regulation pedal starter common to motorcycles, and is equipped with an ignition-lighting system. As the handcar weighs but 350 lb., one man can han-

dle it, and it is claimed that a speed of 40 miles an hour has been maintained for a distance of 72 miles by the car, which is now considered a most valuable aid by the section foreman.



The High-Speed Handcar Placed on the Track and Ready for Use: The Engine, Taken from a Motorcycle, can be Seen Mounted at the Side, with the Exhaust Underneath. The Headlight is Seen on the End below the Seat

AIRPLANE-STABILITY TESTS TO MAKE FLYING SAFE



If an airplane with its rigging intact and a capable pilot in command, responds readily to the controls, most airmen are satisfied to regard it as a stable machine. It is somewhat surprising, therefore, to learn that the standard-rigged "JN-4H," a highly satisfactory training plane, has been found to be unstable by the National Advisory Committee for Aeronautics, after a series of tests at Langley Field, Va. The stable machine is held to be one that will virtually "fly itself" with free controls, and that may be brought to the earth in safety

Jno. W. Kean, Bureau of Navigation
Navy Dept. Washington, D. C.

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These Three Lines Represent the Variation in Forces Applied to the Controls of an Airplane in Flight as They Appear on the Recording Film in a Turn to the Left and to the Right. The Regularity or Irregularity of the Lines Indicates the Stability or Lack of Stability of the Plane

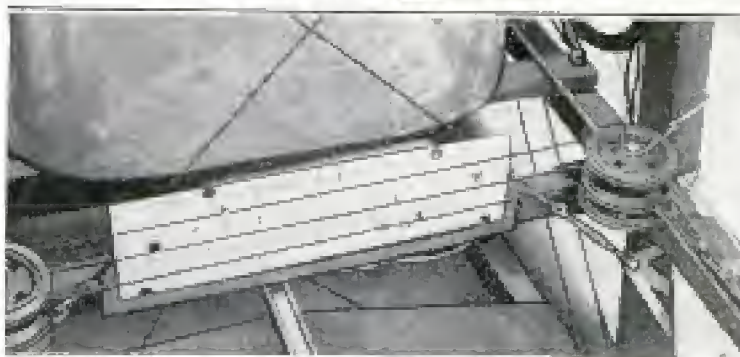
should a control wire become broken or ineffective.

The principle involved in the tests is that of a man holding a mirror which reflects a beam of light upon a moving film. Although his hand may appear perfectly steady to the eye, the unseen tremors will record a series of jagged lines on the film, not unsimilar to the record of a seismograph. In the same manner, the unconscious movements of the pilot in righting his machine against the forces of instability may be recorded.

In the application of the principle to the airplane, the control bar, or "joy stick," may be said to correspond to the hand holding the mirror. The stick has been connected with the mirror of a recording machine which reflects a constant beam of light upon a traveling film. Each movement of the controls in meeting forces is therefore translated to the film, and at the same time the force necessary to over-



A Small Parachute on a Wing Tip Gives a Drag of Known Force, and the Instrument Tells What Control Force is Required to Overcome It and How Much It Affects Stability

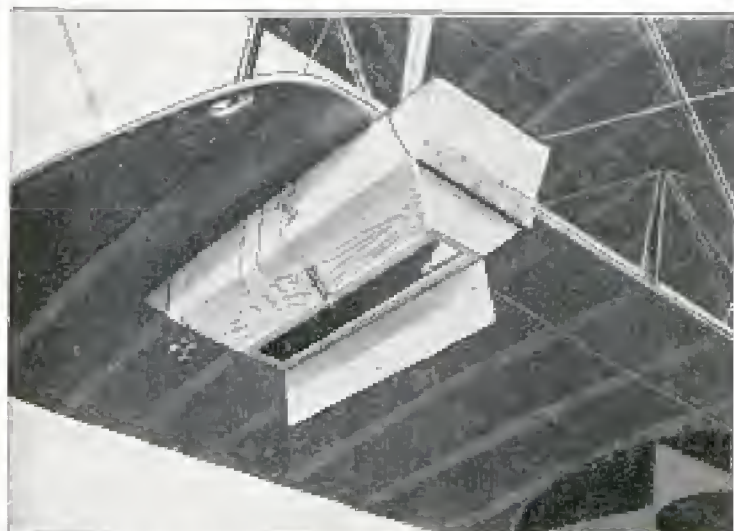


come the unstable tendency is registered on a visible scale in the cockpit.

To determine whether or not a machine is capable of righting itself in the face of weights or drags at the wing tips, ballast boxes and small para-

chutes are fixed on the underside of the lower plane. The machine is unbalanced by emptying the ballast from one of the boxes or by releasing one of the parachutes, and the force necessary to overcome the yaw or sideslip thus produced is recorded at the pilot's position.

Positions Assumed by the Controls in Meeting Forces are Read on This Scale Which is Placed in the Cockpit



A Box on Each Wing Tip is Filled with Sand. By Emptying One Box, the Effect of Throwing the Plane Out of Balance can be Observed

¶The copper roof on the Buddhist temple in Nagoya, one of the principal cities of Japan, is 510 years old and is still in perfect condition.

Cml. Leonard Smith

New York Times 2/16/21
P. 16

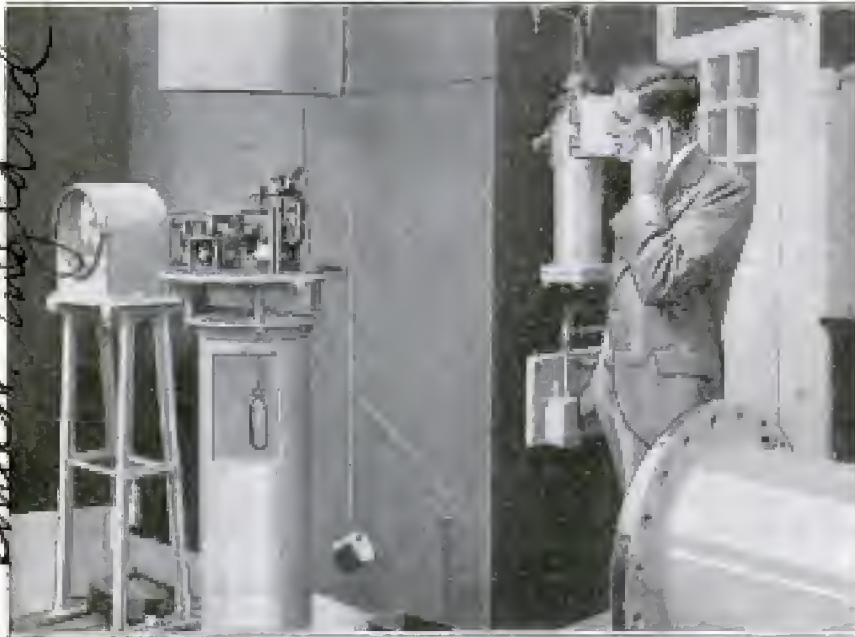
7641 Chamberwell & E. 5,
33, Cruton Road, CLAR, MECHANICS
London, England. 7693

VOICE TELLS HEIGHT OF WATER BY PHONOGRAPH MECHANISM

Warnings are usually given of the rise and fall of water in reservoirs, wells, tanks, etc., by the use of electrically

SCIENTISTS STUDY INFLUENCE OF HIGH ALTITUDE ON LIFE

In the Andes, in Peru, 14,000 ft. above sea level—nearly as high as Pikes Peak—is one of the world's largest copper mines, and the adjoining town of Cerro de Pasco is one of the highest towns having a substantial population. In this high altitude the air is of course exceedingly rarefied, and persons going directly from sea level to this height find physical exertion difficult, and experience other serious discomforts due to the lack of oxygen supply and diminished air pressure. Yet the natives work arduously and live in comfort. What physiological changes—what alterations of the heart, circulation, respiration, chemical composition of the blood, etc.—enable these people to



At the Left: "Visible" Water-Level Recorder. In the Center: "Audible" Mechanism. At the Right, the Man is "Calling Up" the Apparatus

operated alarm bells, but the system of bells has been improved upon by an English concern. The new apparatus, which operates after the fashion of a phonograph, has a telephone receiver placed in front of the speaking tube, and the mechanism is set in motion by the "ringing in," or connection, of a telephone operator. Thus anyone knowing the "number" of the machine, can "call up" and be connected in the same manner that any call is made. To the listener's ears comes the somewhat uncanny voice of the mechanical sentinel, saying anything from "Empty" up to "One double-nought," which means 100 feet.

The appliance has a disk record with 200 concentric grooves, so as to give the height of the water in "half feet," and 78½ ft. would be given as "seven-eight-half," etc. The height of the water regulates the lateral, or side, movement of the arm holding the needle, and the telephone connection automatically lowers the needle upon the record. The readings, or "answers," are repeated eight times, so that the chance of any mistake is reduced to a minimum, and the machine can be "asked" 100 times without being rewound.

Our Bureau of Information is for your benefit. Use it as often as you please.

live permanently in this high altitude? Answers to these questions will be sought by eight medical scientists, five American and three British, who are now en route to Peru. It is expected that the information they will obtain will be useful in the treatment of certain diseases of the heart and lungs and also in the field of aviation.

"SLOW RACE" NOVEL AUTO TEST AT CLEVELAND

It is difficult to find anything new in the way of automobile tests nowadays, but the novelty of a recent race in Cleveland, Ohio, is attracting attention. A local automobile manufacturer invited all drivers of his cars, in the city, to enter a "slow race." The course extended 2.3 miles through the city parks. Ten entrants started their cars, shifted to high, and got out before crossing the starting line. They then walked beside the cars, controlling them by the spark lever only. The winner completed the course in 46 min. 10 sec., and the second car in 40 min. 1 sec. The police department, hearing a race was to be held, sent several mounted police to the scene. They soon decided the race would not interfere with traffic, but became interested and joined the large crowd of spectators, which had gathered to watch the novel event.

J. K. Schmidt
90 Plain Dealer,
Cleveland, Ohio.

Mr. George Kent. 199 High Holborn, London England

5986 Cml. Lindsay C. Marshall
Cambridge, Ma

DREDGING OYSTERS ON THE ICE

By Lindsay C. Marshall



The Men are Dragging the Oyster Dredge over the Bed from One Hole in the Ice to Another, the Rope Passing along a Narrow Slit Cut in the Ice

OYSTERS in the Maryland rivers are not safe from capture even when protected by 9 to 12 in. of ice. Ordinarily, the bivalves are won from the shallower portions of the oyster bed by means of tongs not exceeding 20 ft. in length; but about once in every five years an unusually cold winter closes to the oyster men the ordinary avenues of reaching their "game," and they are forced to resort to ice dredging. The ice, however, is not an unmitigated evil, for

it enables the men to reach the deeper portions of the beds, 40 ft. or so below the surface, and these are the more profitable because of being worked only occasionally.

The method of operating is simple but effective. A long rope is fastened to an ordinary oyster dredge, which is then lowered through a hole in the ice to the oyster rocks below. The dredge is drawn by man power to a similar hole some distance away, the rope working in a nar-



Sorting the Marketable Oysters from the Smaller Ones and the Débris Brought Up by the Dredge: The Young Oysters are Redeposited on the Bed and the Refuse Left to Disappear with the Ice



Sledding the Catch across the Ice to Market: The Difficulties Incident to Ice Dredging are Offset by the Higher Price Due to Scarcity

Great Choptank River
About 3 miles from Cambridge Md

7642

SINGLE-DECK SHIP CONVERTED
INTO OIL TANKER

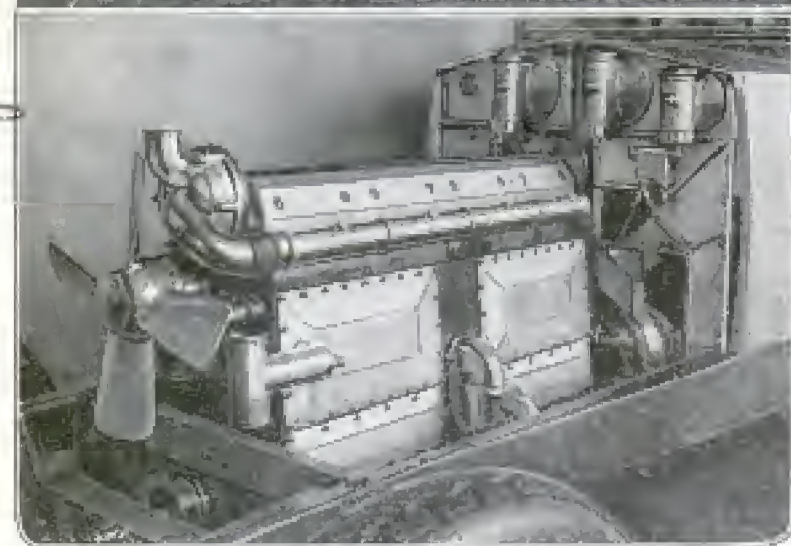
row connecting slit cut in the ice. The men usually work in gangs of five.

Once on the surface, the oysters of marketable size are culled from the smaller ones and the trash included in the haul.

LATEST ENGLISH CAR HAS
"STRAIGHT EIGHT" MOTOR

A new development of the high-priced automobile is seen in the product of an English firm. It is the first British car

By the use of specially designed tanks, an ordinary single-deck steamer has been converted into an oil tanker. The vessel, owned in Glasgow, Scotland, is of 5,522 gross tonnage, and is fitted with three main cargo tanks forward, and two abaft of the machinery space. These are constructed of four segments of cylinders attached at their ends to deep frames at the ship's side, and at their inboard ends to

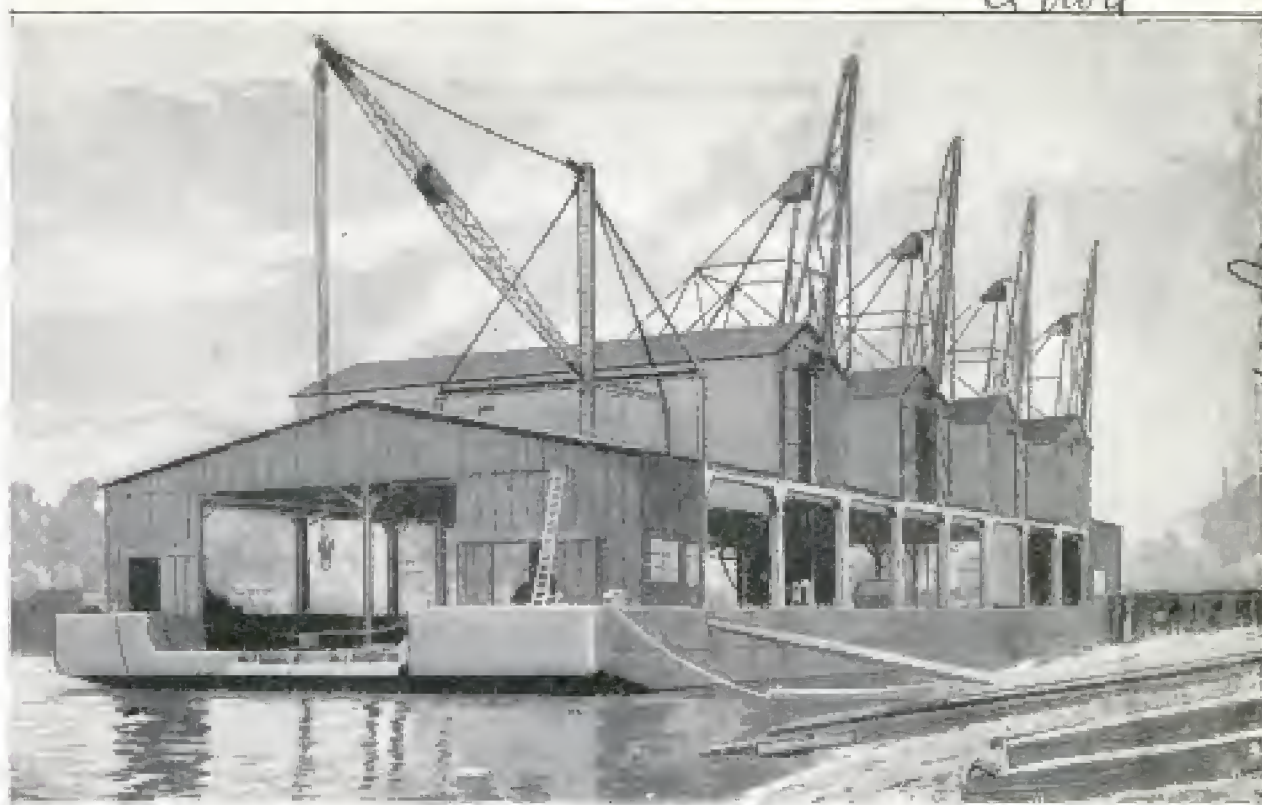


The New English Automobile, Shown Above, is Equipped with a Straight Eight-Cylinder Motor. It is the Most Recent English Development of the High-Priced Motor Car. The Motor is Shown at the Left. The Neat, Narrow Effect of Placing the Cylinders in a Single Straight Line Instead of the Usual V-Form, can be Appreciated. It is Rated at 40 Horsepower and is Equipped with a Thermostatic System for Control of the Temperature. A Starting Motor is Built into the Gear Housing.

with eight cylinders in one line instead of the usual V-form. The engine is narrow and particularly neat in design. It has overhead valves and is rated at 40 hp., has thermostatic control of engine temperature, and a single-disk clutch. The car is provided with four speeds, and the starting motor is built into the gear housing. It has a beveled rear axle, splayed axle shafts and wheels, and an effective torsional antirolling device applied to front and rear axles.

vertical webs. The forward and aft tanks are shaped in conformity with the ship's lines. Together these tanks have a capacity equal to the vessel's full dead-weight carrying capacity, and the spaces between them, being buoyancy compartments, add to the stability. The tanks are connected to the upper deck above and to the inner bottom below, and together with the deep vertical webs between them, do away with the necessity for a center-line bulkhead.

Clava



The Large Government Barge, Which Has Four Electric Cranes with 45-Foot Projecting Tracks Folded Up along the Side, and a 20-Ton Hoisting Derrick; At the Ends Are Large Openings for the Passage of Railroad Freight Cars, of Which 12 can be Accommodated on the Three Tracks of the Barge at One Time. The Inclosed Roof is Constructed of Steel

GIGANTIC SERVICE BARGE FOR MISSISSIPPI SHIPPING

The singing, whistling, and happy-go-lucky negro roustabouts are being superseded by electric cranes and hoisting derricks in the handling of freight on the Mississippi River. During the late war, the government let contracts for the building of large terminal barges, and the last of this type of barge to be completed has recently been stationed for service at St. Louis. The barge is 320 ft. long, which is longer than an ordinary city block, is 75 ft. wide, which would be about twice as wide as a city street, and has an inclosed steel roof. The hold of the barge has been divided into compartments for carrying fuel oil, or similar liquid cargoes, and there are two electric pumps for transferring the liquids to boats or tank cars. Three railroad tracks are laid on the deck, and 12 freight cars can be run onto the barge at one time, to be unloaded. Four electric cranes and a 20-ton hoisting derrick are used for unloading, and the cranes have a projecting track which allows them to run out over the side for a distance of 45 ft. The projecting tracks can be folded up when not in use. The barge is electrically equipped throughout, and for night illumination, 24 clusters of lights,

aided by a row of lights along the side, have been installed. In addition, there are 16 portable clusters of lights with reflectors, which can be placed where needed. Boats plying between St. Louis and New Orleans, and St. Louis and St. Paul, will use this barge, which cost 400,000 dollars.

GOVERNMENT SCIENTISTS WILL STUDY LAND REQUIREMENTS

In appointing a committee of five scientists from the Department of Agriculture to study the important problem of land utilization with regard to future requirements, Secretary Wallace called attention to several important facts. Many people believe that, with less than one-half of the national area in farms and only about one-quarter of it improved land, there is an unlimited reserve supply of farm land. By far the greater part of the 1,000,000,000 acres not yet in farms can never be used for growing crops, and land that can be made into farms will require heavy expense for clearing, drainage, irrigation, or fertilization. At the normal rate of growth, the population of the United States will reach 150,000,000 by 1950, requiring an addition of 243,000,000 acres of improved land, if the present per-capita acreage is to be maintained.

N.Y. Times 11/10/21
 Page 3

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LARGEST FIREPROOF HOSPITAL IN THE WORLD



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SITUATED to the west of Chicago, near the suburb of Maywood, is what was formerly known as the Speedway Hospital. More recently its name has been changed to the Edward Hines Jr. Hospital. It got its original name from the fact that its site was formerly a speedway for automobile racing. It is a U. S. government hospital for sick and wounded soldiers and sailors, increasing numbers of whom are being cared for there. It is entirely fireproof, and is 2,040 ft. long, 50 ft. wide, and four stories high. It contains 1,284 rooms, 500,000 sq. ft. of cement flooring, and 200,000 sq. ft. of roofing. The grounds have an area of 320 acres. The surrounding scenery is somewhat bleak, but this affords the advantage of offering no obstructions to the circulation of fresh air.

7604

COURSE OF RIVER CHANGED BY SINGLE BLAST

Because of the new channel that was scoured out by the Arkansas River at a point 14 miles above Pueblo during the season of disastrous floods last year, it was found necessary to change the course of the river again to provide water for the irrigation projects. It was proposed to blast down an overhanging rock and thus form a dam that would force the water into the irrigation ditches. The lower part of the rock was sandstone, while above were thin strata of limestone and shale.

It was along the base of this rocky bluff that the new channel had been formed.

Owing to the fact that, after the waters had subsided, most of the flow continued along the new channel, the head on the ditch gates was greatly lowered.

For this work of blasting, 5,000 lb. of black powder was used to shatter the rock, and considerable dynamite was mixed with the powder to insure better ignition and splitting effect. A tunnel, 6 ft. high and 4 ft. wide, was driven 35 ft.

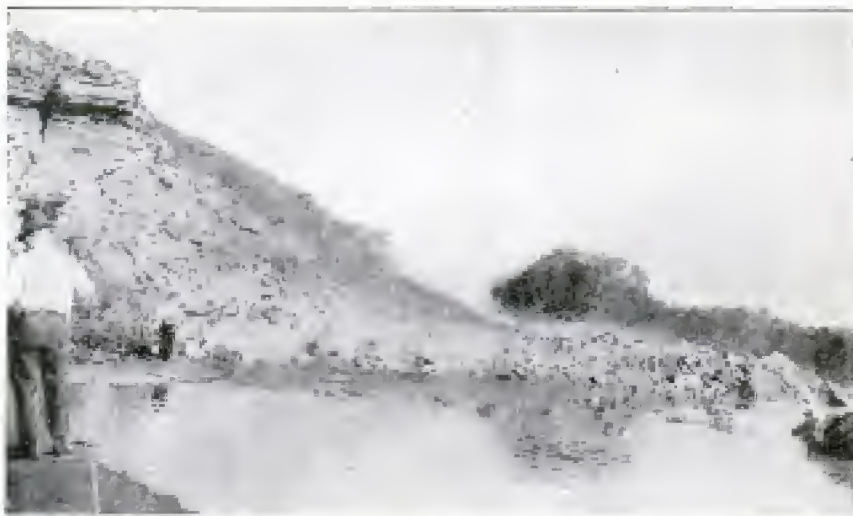
900 Ellsworth Bldg.
Chicago, Ill.



Before the Blast the River Flowed in Its New Channel about the Base of This Cliff

point 14 miles above Pueblo during the season of disastrous floods last year, it was found necessary to change the course of the river again to provide water for the irrigation projects. It was proposed to blast down an overhanging rock and thus form a dam that would force the water into the irrigation ditches. The lower part of the rock was sandstone, while above were thin strata of limestone and shale.

Capt. George F. Paul,



Five Thousand Pounds of Powder and Dynamite Blew the Cliff into the Channel, Effectively Damming It So That the Current was Controlled and Water Was Again Available for the Irrigation Ditches

straight into the cliff, with a 5-ft. side branch at this point, whereupon the tunnel was driven 10 ft. farther. It was in this last part that the charge was placed.

When this tremendous charge was touched off, a block of the cliff was torn off and fell, crushed into fragments, thus forming a dam across the channel and

DOGS USED FOR WINTER TRAVEL IN NORTHERN QUEBEC

At Sanford Junction, Quebec, Can., a favorite means of travel in winter is on



Dogs at Work in Northern Canada, Where They Are Most Important in the Winter Life of the People



Dogs Also Take Part in Winter Sports as Shown at the Right. Ski Riding, with a Dog to Pull the Rider, Is Great Fun—for the Rider



controlling the current, as had been planned. In a short time the irrigation ditches were filled to capacity because of the 8,000,000 lb. of rock that had been dislodged in the single great blast of powder and dynamite.

¶Vessels at sea are to be supplied with a radio-news service relating to derelicts, sunken or floating wreckage of all kinds, misplaced harbor buoys, mines, ice, rafts, and any other items of interest, through an arrangement between the U. S. Navy Hydrographic Office and the Naval Communication Service.

skis, with a dog, in harness, to pull the ski rider over the frozen trails. There, throughout a large part of the year, dogs furnish the most important, if not the only, means of transportation. They are used for all kinds of hauling and some of the things they can do are surprising to a person unfamiliar with the use of dog sleds. It is a common thing for two dogs to haul a log 25 ft. long and 10 in. thick at the butt. Again, their load may be ice, to be stored for the summer, firewood, or provisions, and the passenger sled is an everyday necessity, which is ordinarily pulled by a single dog.

*Carl Henry Sanford
Sanford Station, I. L. St. Ry
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I no. Chas. Weber
52 Gray St. Newark, N. J.
POPULAR MECHANICS

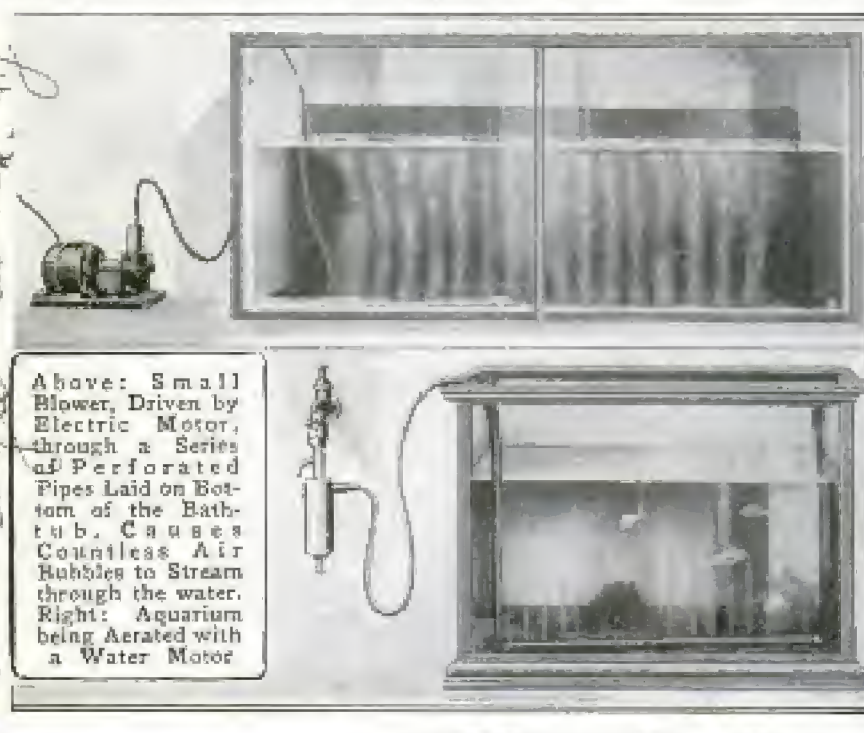
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7334

APPARATUS FOR AERATING WATER IN A BATHTUB

Bathing in water medicated with gases, such as carbonic acid or oxygen, is a well-

known treatment for various complaints. It is claimed that water aerated by a new

device is just as beneficial. The aerating apparatus consists of a small blower direct-connected to a tiny electric motor. A hose connects the discharge port of the blower to a series of perforated pipes laid on the bottom of the bathtub. From the perforations countless little air bubbles continuously float upward through the water to its surface. The speed of the motor can be controlled to regulate the flow of these bubbles as desired. The same thing is done, but with less pressure and with only a single pipe, in aquariums.



Above: Small Blower, Driven by Electric Motor, through a Series of Perforated Pipes Laid on Bottom of the Bath-tub. Causes Countless Air Bubbles to Stream through the water. Right: Aquarium being Aerated with a Water Motor

SUSPENDED FERRY CARRIES TRAFFIC ACROSS ENGLISH RIVER

A NOVEL kind of bridge for transporting pedestrians and vehicles across a river, without interfering in any way with the passage of full-rigged ocean-going shipping, is in operation at the town of Newport, Eng., on the river Usk, four miles from its junction with the Severn. On account of the steepness of the banks, the great rise and fall of the tides, the length of the span, and the height of headway needed, any ordinary kind of bridge was impracticable, and therefore this special kind, called a "transporter bridge," was erected.

The stationary members of the bridge consist of a pair of supporting towers, 242 ft. high, on each bank of the river. These carry two trussed girders, 16 ft. deep and 26 ft. from center to center, across the span of 645 ft. The towers are braced, and the girders are partly supported by cables in the manner of a suspension bridge. The towers are of steel latticework, and each pair, connected above to the trussed girders and inclined outwardly at their concrete foundations, resembles closely a pair of exaggerated derrick booms. The total clearance from high-water level to the underside of the span is 177 ft. The

horizontal trussed girders are tied together and braced as in any ordinary bridge span, and their bottom chords form a track, in each case, for 15 wheels on either side of its web. These wheels are carried on steel brackets which are part of a large traveling frame, 104 ft. long, which forms the means of transporting a suspended platform or carrier. This is like a section of a bridge deck, 33 ft. long and 40 ft. wide. It has a central roadway large enough for two four-wheeled vehicles, and on each side there is a roofed-in sidewalk. The whole is electrically lighted. The suspension of this carrier from the traveling frame above is a very elaborate system of 30 cables, trussed so as to brace the carrier against swaying under any wind conditions. The traveling frame that transports this carrier is propelled by a continuous cable driven by a drum in connection with two 35-hp. electric motors in the power house near one end of the bridge. All control is operated from a pilot house on the carrier, which moves at a speed of 60 ft. a minute, taking 10 minutes to cross from bank to bank. The bridge is designed to carry safely a moving live load of 66 tons.

Carl Leonard Smith, 33 Crofton Road
Camberwell, S. E. 5, London, England.

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7559



Left: View from Water Level of the Transporter Bridge, Showing the Platform or Carrier That is Suspended from the Traveling Frame above, and Which Transports This Carrier across the River. The Central Part of the Carrier Is for Vehicles and the Covered Sidewalks Are for Pedestrians. The Elaborate System of Suspension Cables Prevents Swaying under Any Wind Conditions. The Two Inclined Towers at the Farther End Support the Trussed Girders and Their Bracing. Above: Upper View of These Trussed Girders and Their Bracing



The Transporter Bridge Complete without the Traveling Frame and the Suspended Platform or Carrier Which It Transports across the River: From One Pair of Supporting Girders to the Other, the Span of the Trussed Girders and Their Bracing Is 645 Feet. The Towers are Braced and the Trussed Girders are Partly Supported by the Suspension-Bridge-Like System of Cables and Hangers Seen in the Picture

CARNIVAL CROWD ENTERTAINED BY NOVEL PUSHBALL GAME

Among the many variations of the game of pushball that have appeared from time to time, one of the most novel



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An Exciting Moment in the Game of Firemen's Pushball: With Spray Flying in All Directions, the Players are Taking the Ball down the Field for a Try at Their Opponents' Goal

has been the use of hose as the means of driving the ball. Such a game, played at a recent carnival at Sevenoaks, Eng., could well be called firemen's pushball, for it was played by two teams, each composed of four local firemen equipped with fire hose. The streams of water were the only means allowed for pushing the ball, and the game became fast and exciting. Of course the players were soaked, and occasional showers which sprinkled the spectators only added to the general merriment.

"HOME-PORT" PLATES POPULAR FOR AUTOMOBILES

Automobile owners in different cities throughout the country have recently been won over to the fad of carrying across their radiators, suspended from the light brace rod, neat brass or black-and-white plates bearing the names of their home towns.

Stealing a leaf from the book of ship-owners, the motorists are labeling their cars with their "home ports," and it is hinted that the plates serve a double purpose. They not only inform citizens of different communities regarding the home towns of visiting motorists, but in those towns they stamp the resident motor owner as such, and perhaps win for him a little more consideration from the police than the visitor gets.

Reckley - Palston
Can supply in
lots of 100.

LAUNDRY ASSOCIATION TO HAVE METHODS-TESTING PLANT

An American institute of laundry-research work, for testing laundry methods, materials, and machinery, will be established by the Laundry Owners' National Association, at some town near Chicago. The association already maintains a fellowship in the Mellen Institute of Pittsburgh for chemical research, which has done much good, but it is so anxious to improve laundry methods that it intends to establish its own laboratories and maintain its own experts. The idea is not to build a model laundry. The plant will be a place where members of the association may have their individual problems worked out, or where they may send members of their staffs for study and observation. The plans are already completed.

TEST MAKES BURIAL VAULT SERVE AS WATER CRAFT

Paddling down a river seated on top of a 600-lb. iron vault, is a curious method of travel, but it was used recently on the Sandusky River at Upper Sandusky, Ohio. It was not a pleasure trip, however, but a public demonstration of the water-tight character of that particular make of burial vaults. After a one-mile trip, during which the vault was in the water for one hour 55 minutes, it was found to be perfectly dry inside.



Hardly a Rival for the Birch-Bark Canoe as a Means of Travel, but a Most Effective Test of the Water-Tight Character of the Vault

Windsor Burial Vault Co
Upper Sandusky, Ohio.

7458
Larson Tool & Stamping Co
Attleboro, Mass
C. H. A. Leamy
c/o The Sun, 280 Broadway
N.Y.C.



TERRACED SUMMER GARDEN FOR GOVERNOR OF THE PHILIPPINES

WHEN General Wood inspected his future summer home, as governor of the Philippines, recently, he was delighted with this beautiful terraced garden, reached by many flights of stone steps from his summer residence. It was originally planned, on the hillside at Baguio, Benguet Province, by the natives, but was completed by expert Filipino landscape gardeners. The general effect of the garden is Oriental, but there is also an entirely original atmosphere about it, not to be found anywhere else in the world.

5434

OLD TELEGRAPH CABLES USED TO BUILD FOOTBRIDGE

A very interesting footbridge spans the North Thompson River in British Columbia, of which the entire superstructure is built of cables. These cables are made up of 15 strands of galvanized wire which was originally intended for use in a telegraph line that was to reach Paris from New York, over Alaska and Siberia. The project was abandoned, however, when the Atlantic cable was successfully opened. The cables and other material were then cached at various points along the proposed route of the telegraph line and were subsequently appropriated by the settlers. In

its final use as the suspension footbridge, the wire still performs important service.



Footbridge Suspended by Means of Cables Which were Originally Intended to be Used as Part of a Telegraph Line from New York City to Paris, France, by Way of Alaska and Siberia

Emil. L. P. Melrose Box 290
Kamloops, B. C., Canada

Cmt. Anthony Robinson

New York Times

Box 283
64

San Marcial

10/21/24

POPULAR MECHANICS

P. 16, Vol. XVI, 165

7529 IMPROVED RAILWAY SIGNALS
INSURE SAFETY IF BROKEN

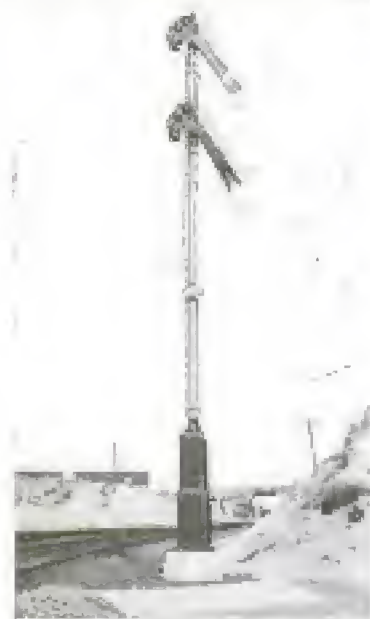
In the old, and still nearly universal, type of railway signal, the semaphore or



Two Samples—One with Single and the Other with Double Semaphores—of the New Railway Signal That Rises, Instead of Falling to a Horizontal Position, to Indicate Safety

arm stands horizontally to indicate danger, and falls to a position parallel to the post to indicate safety, or line clear. The objection to this method is that in case of a break in any part of the operating mechanism the semaphore may drop by gravity

to the hanging position, and thus signal safety when there might be danger. In a new form of signal, by reversing the position of the semaphore and making it stand upward instead of downward, to indicate safety, it is obvious that in case of a break of the operating mechanism the force of gravity brings the semaphore to



Ordinary Type of Railway Signal in Which Semaphores Hang Vertically to Indicate Safety or as Shown to Indicate Caution

the horizontal position, where it is stopped, indicating danger instead of

safety. This may cause some delay and inconvenience, but it will never lead to a wreck, as has actually occurred more than once with the other method.

4563
SIX-MILE EXTENSION PROPOSED
FOR MANHATTAN ISLAND

About 10 years ago T. Kennard Thomson, a well-known engineer, startled New York City by a proposal to extend the area of Manhattan Island by means of built-up land. The plan, described in Popular Mechanics of August, 1911, has again been proposed, to the Broadway Association, which has been convinced of its desirability, if not of its practicability. The idea is that, by means of concrete sea walls, the island can be extended about six miles into the bay, close to the coast line of Staten Island, adding about six square miles of extremely valuable real estate to Manhattan Island. This would relieve congestion, keep the center of the city in its proper place instead of allowing it to follow the present tendency to drift north, and enormously increase the tax resources as well as debt limit of the city. Returns from such a project, if carried out, would far more than compensate for the expense involved.

7342 Water
STANDPIPE BUILT OF CONCRETE
IS UNUSUAL AND ARTISTIC

A standpipe, which is both unusual and artistic in appearance, was built to furnish a reserve supply of water to a hospital near Grand Rapids, Mich. It is constructed entirely of concrete, including the cross girders and braces, as well as the supporting columns. Even the supply pipe, which connects the tank at the top with the water mains, is of the same material. The tower is 300 ft. high and 50 ft. in diameter at the base.



Cmt. Worth C. Knowles
Atsigo, Mich.

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7280 Cnd. Arthur Hallam

317 Cedar Ave.

POPULAR MECHANICS

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Minneapolis, Minn.



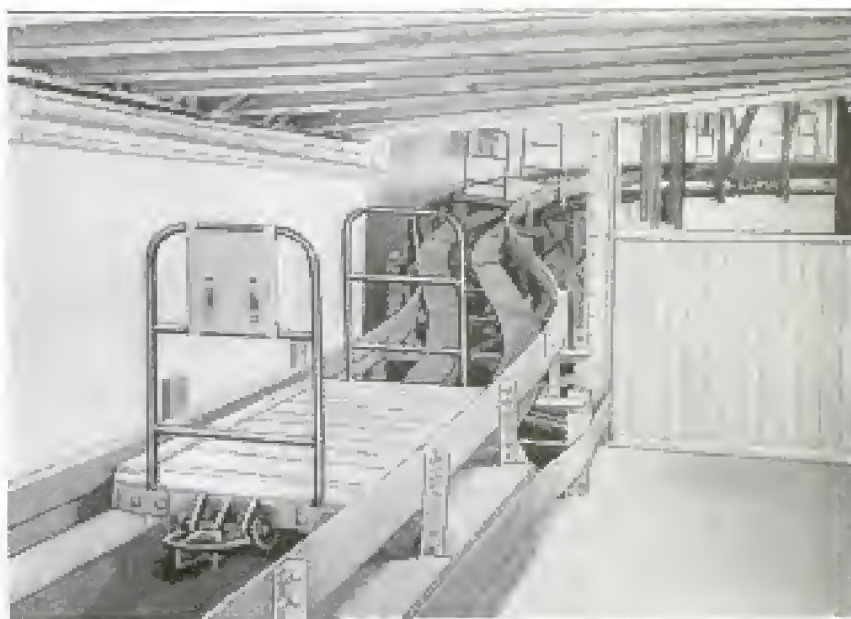
When the Trucks have been Loaded by the Warehouse Tenants, They are Delivered to a Tunnel by Elevators, Made Up into Trains like This, and Hauled through the Tunnel by Tractors to the Freight Station at the Other End. There Are Two of These Warehouses Now in Operation in Minneapolis, Minnesota, and More will Be Ready Shortly

7280 TERMINAL-WAREHOUSE SYSTEM DEVELOPED IN MINNEAPOLIS

A new warehouse system affords facilities to manufacturers who wish to establish branch warehouses in Minneapolis, Minn. Space is rented in a series of standard warehouses, two of which are completed and in operation. At one end of the system is a joint freight station, connecting with all steam and electric railroads entering the city. Each tenant loads outgoing shipments onto small trucks and delivers them to elevators which carry them to a tunnel. An electric towing car picks up the loaded trucks and hauls them through the tunnel to the freight station, where the goods are loaded into cars. The loaded cars are pulled to the city transfer yards for distribution to the roads over which they are routed. A post office and express office, in the station, take care of shipments to be made by mail or express, and motor trucks handle city deliveries so that the tenant need not invest in trucking equipment. The small trucks, when emptied, are returned by a gravity

track to the warehouses, where tractors distribute them to the tenants' elevators. Incoming freight is handled in the same way from the station to the warehouses. A system of sidetracks and loading platforms is provided along the warehouses for handling carload shipments.

¶ We want all our readers to write us freely and often whenever they wish additional information on articles published in this magazine. Address Bureau of Information, Popular Mechanics, Chicago.



After the Trucks are Unloaded at the Freight Station, They are Placed on a Track and Run Back to the Warehouses Where They are Redistributed to the Tenants. Some of Them can be Seen Here Running Back by Gravity

Chas. J. Schmidt
3557 St. Charles Place

Commerce
Reports
Oct. 31, 1921

66
7523 Hyde Park, Cincinnati, Ohio

**CINCINNATI FIRE DEPARTMENT
OPERATES A "COFFEE TRUCK"**

Firemen in Cincinnati, Ohio, will always be sure of a cup of hot coffee when fight-

**RICE HULLS ARE CONVERTED
INTO USEFUL PRODUCTS**

The amount of waste in the rice crop has always been about one-third of the



Some of the Firemen of the Cincinnati, Ohio, Fire Department and Their New "Coffee Truck," Which Answers All Night Calls: The Fire Fighters will Always Have a Cup of Hot Coffee to Thaw Them Out in Freezing Weather

ing fires this winter, and will no longer have to depend on the possible generosity of some restaurant proprietor when cold and weary from their strenuous work. A "coffee truck" has been added to the department's equipment and answers all calls to big fires at night. It is a light truck with a big coffee urn mounted on the rear. A special subscription fund, to which all the city firemen contribute, keeps it going.

**HIGH-GRADE IRON PRODUCED
FROM MAGNETIC SAND**

The process developed in New Zealand some time ago, of converting the large deposits of iron, or magnetic, sand found there into pig iron, has been adopted by the Japanese for the exploitation of their own vast deposits of this form of ore. The process consists of combining the iron sand with coke, by using hot gas flames. The product is then called ferrocoke, from which a fine grade of iron is easily produced.

Those wishing farther information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.

cient quantities to be commercially worth while reclaiming.

**RAILWAY COAL BILL REDUCED
BY CONSTANT REMINDERS**

For the purpose of constantly impressing upon its employes the virtue of saving coal, a railroad has placed many reminders along its right of way. This



This Shows One of the Railroad Towers along the Right of Way with a "Reminder" Posted upon It That will Be Sure to Catch the Eye of the Locomotive Crew

experiment has been in effect for some time, and according to the officials of the road, has given very satisfactory results.

Central R. R.
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Wide World Photos, 229 W 43rd St.
New York City

NINE-HOLE GOLF COURSE WITH UNUSUAL HAZARDS

BY H. A. LANE

THAT variety is the spice of life is certainly illustrated on an unusually laid-out golf course in England. Hazards, bunkers, and obstructions of all sorts, abound on this oddly constructed course, but in spite of these handicaps, it is said, a very good game is being attained. In this country, the chief hazards are sand pits, water, or uncut grass, called "the rough," and these are found upon the fairways, or in other words, the distance between the putting green of the hole ahead and the tee from which the player is driving. The putting greens are always kept smooth and free from anything that would deflect the course of a ball. The freak course in England, however, has tees elevated on boxes, and on the fairways are found nets with a small hole in them, through which the ball must be lofted. Wire screens and



This Greatly Elevated Tee is a Very Unusual Hazard, and Is a Test of the Golfer's Ability at the First Shot of the Game



Here is Seen a Net through Which the Ball must be Driven, and Which Requires Accurate Driving with Mashie or Iron Club



View of One of the Putting Greens, Showing a Wooden-Trough Arrangement Which Makes This Hole Very Difficult to Play. Left: The Putting Green, Which is Usually Kept So Smooth and Free from Any Obstructions, Here Has a Wire Screen and Bushes upon It



bushes are placed on the putting greens, as well as wooden-trough arrangements, which make it a very difficult task to get the ball in the hole. Those who follow the game of golf will readily appreciate the trouble that would be encountered in overcoming these unusual handicaps.

SIMPLE BULK-GRAIN LOADER IS INEXPENSIVE

Simple, inexpensive equipment for loading bulk grain into railroad cars is provided by a lately developed conveying apparatus. The loader does not provide storage space. Grain is dumped into a concrete pit, from which it goes through a regulating gate into the elevator boot. Here a bucket and belt conveyor picks it up and carries it to a hopper at the head of the elevator shaft. From the hopper the grain is carried through a metal pipe and flexible loading spout to the car, the spout serving as a nozzle to distribute it. Power for driving the conveyor is furnished by a small gasoline engine. The equipment can be installed where the expense of an elevator would be prohibitive. It is made in sizes to handle either 1,000 or 2,000 bu. an hour.



Loading a Box Car with Bulk Grain by Means of a Simple New Conveyor Device: It is Made in Two Sizes, One Handling 1,000 and the Other 2,000 Bushels an Hour, and Is Inexpensive to Operate

TELEPHONE-REPAIR TRUCK WITH NOVEL FEATURES

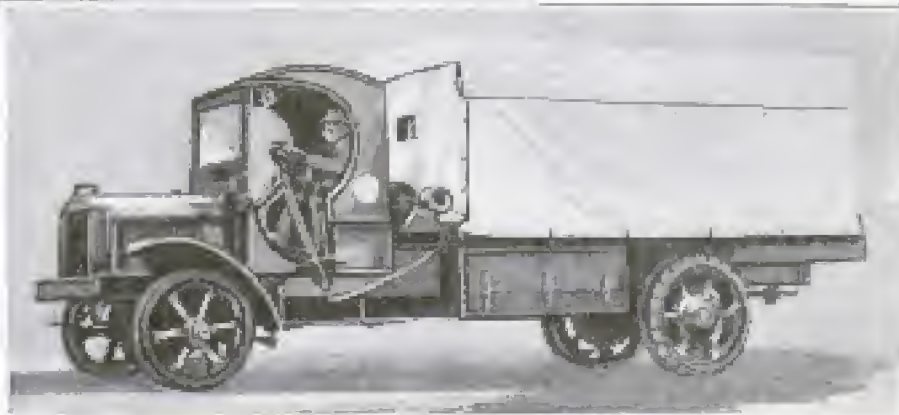
Several novel features are incorporated in a repair motor truck designed for a

Pacific-coast telephone and telegraph company. The truck, behind the driver's cab,

is of ample dimensions and can be completely inclosed with curtains. It has seats for workmen, removable so that it can be used also for transporting freight. Behind the cab is a winch operated by a crank at the side of the cab, which is used for winding or unwinding cables. These pass under the truck to the rear, where they are guided by a pulley and guide plates.



A Telephone and Telegraph-Repair Motor Truck, That can be Completely Inclosed with Curtains, as Shown to the Right, and Has Removable Seats for Workmen So That It can be Used as a Freight Truck, as Shown Above: Behind the Driver's Cab is a Winch for Winding Cables

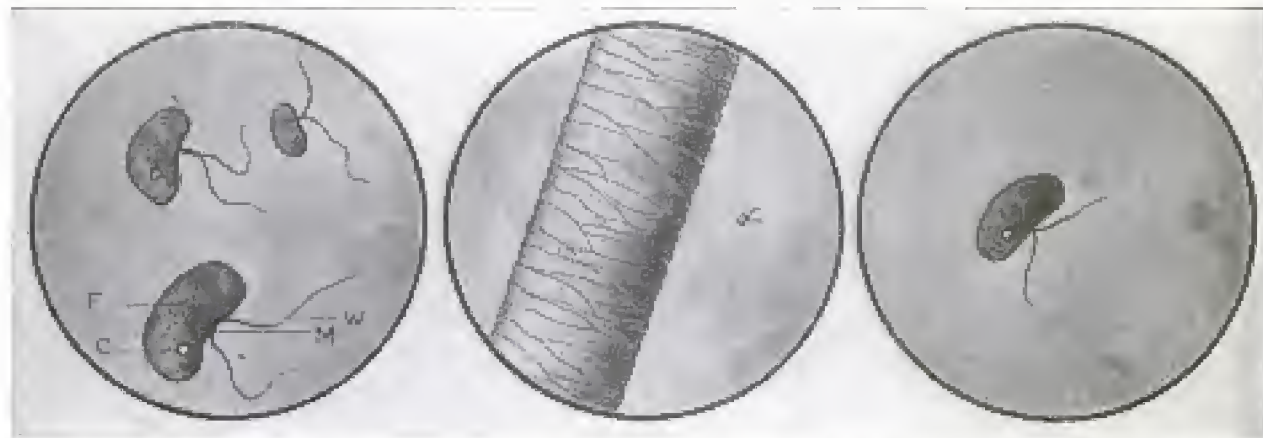


CAPTURING THE SMALLEST ANIMAL IN THE WORLD

BY LEON AUGUSTUS HAUSMAN, PH. D.

WE have become a bit blasé, during recent years, to accounts of animals of prehistoric existence, whose dimensions dwarfed those of our present animal

In diameter, along the longest axis, its body rarely reaches a length of eight or nine microns (about $\frac{1}{12,000}$ of an inch), and the writer has often found individuals



Figs. 1-3. Microscopic Views of the Smallest Animal in the World: Left to Right, Varying Shapes of Its Body, W Being the Whips or Flagellums; M, Mouth; C, Organ of Excretion, and F, Food Particles; Single Specimen beside a Piece of Human Hair, and a Specimen Photographed through Microscope

forms. Possibly then, our wearied enthusiasm for the unusual in zoölogy may be revived by a report of the capture and study of a creature which, in size, stands at the other extreme from the titanic dinosaurs of yore.

The smallest speck which can be detected by the average unaided eye, is a bit of opaque, white substance, about 50 microns (.002 in.) in diameter, seen against a black background. But the creature here under consideration is only one-twenty-fifth of this size. A graphic idea of its extreme smallness can be had by comparing it with the ordinary human hair.

In Fig. 2 is shown this, the smallest animal in existence, compared with a human hair, ordinarily averaging 50 microns in diameter. This diminutive creature, however, rejoices in a name which yields nothing in length and impressiveness to the appellations borne by the mightiest dinosaur science has to offer, for it trails after it the resounding cognomen of *Pleuromonas jaculans*.

as small as two microns ($\frac{1}{12,000}$ of an inch).

Figure 1 shows three typical individuals. The body is somewhat the shape of a kidney bean, with two long whiplike threads extending from a depression in one side. With these whips, known as flagellums, the creature makes its rather jerky way through the water in search of food, for it lives in pools and ponds amid decaying vegetation, where an ample supply of bacteria and juices from the disintegrating plant tissue is always present. These serve as its food, which is absorbed into the soft jellylike area at the base of the flagellums. The life of a single individual is usually but a few hours. At the end of that time the creature simply divides into two new individuals, both of which swim away, feed, and increase in size, and then themselves divide, and so on.

In Fig. 3 is shown an unusual photograph of this most minute animal form of which we have record, magnified many thousand times.

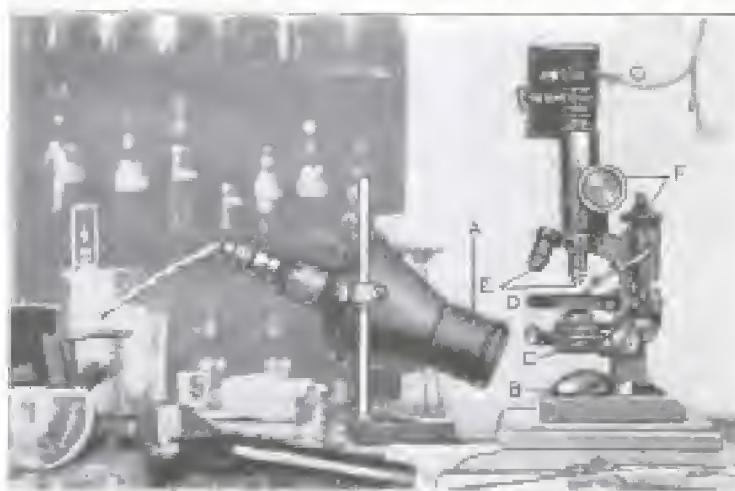


Fig. 4. The Compound Microscope for Extremely Minute Work That was Used in Obtaining the Three Views Shown in the First Illustration: A Is a Tungsten Lamp of High Power; B, the Microscope Mirror; C, the Condenser; D, the Stage; E, Objectives; F, Focusing Screws, and G, the Ocular or Eye-piece

most minute animal form of which we have record, magnified many thousand times.

The capture of *Pleuromonas*, while not involving any of the risk to life and limb which attends the capture of our largest living animal forms, the whales, still in-

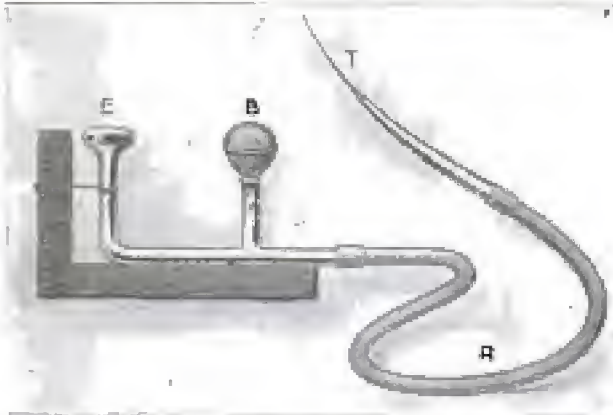


Fig. 5. Capturing the *Pleuromonas*: Laying Finger Tip on End, E, Heats Air, Driving Some through Tip, T, Which is Then Inserted into Water Drop under Microscope. Removing Finger Cools Air, Drawing into Pipette Water with One of the Creatures. Pressure on Rubber Bulb, B, through Tube, R, Deposits Object Where Desired

volves as great time, patience, and perseverance on the part of the "hunter." In Fig. 5 is shown the apparatus, devised by the author for the capture of the protozoa (the first great division of animals to which *Pleuromonas* belongs), under the microscope. By skillful manipulation of

the tip of the pipette under the objective of the microscope, it is possible to secure single individuals of *Pleuromonas*, and to transfer them either to glass microscope slides or to sterilized culture jars, to breed a new race. And many failures, either to capture or to transfer these tiny animals from one place to another, is the lot of the hunter after the smallest animal in existence.

Pleuromonas claims our interest, not only because it is the most minute form of animal life known to exist on our earth today, but because it is of actual economic value to us as well. Often bodies of water filled with putrefying plant remains will be colored a milky hue by the immense numbers of these tiny creatures, each one of which is a valuable scavenger, helping to transform decaying vegetable tissue into animal substance. The *Pleuromonas* are devoured, in their turn, by larger forms of the protozoa, or single-celled animals, which again are eaten by minute crustacea and insects. And these last constitute one of the most important supplies of fish food. In many cases, therefore, these tiniest of nature's children are the ones to take the first step in the great work of making many of our waterways sweet and pure.

COLORS ARE NOW NUMBERED, MEASURED, AND MATCHED

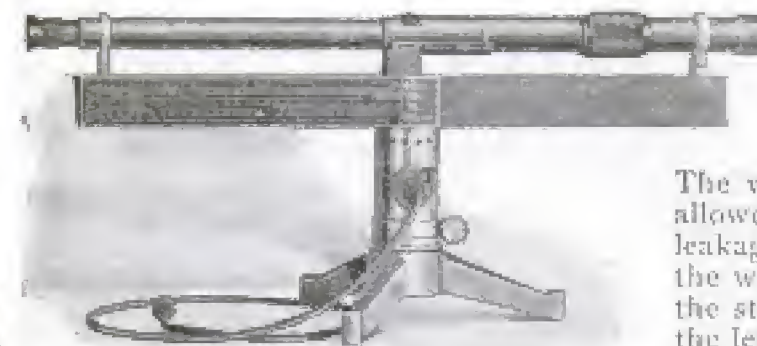
By a new method of analysis, colors can be designated by a series of numbers after they are matched, and these numbers are then recorded, so that an exact duplicate of the color can be produced at any future time. The instrument used is called a colorimeter, and is intended for use in the factory or laboratory, for the matching of colored materials and liquids. In operating, a white light from a standard lamp illuminates one-half of the field

of view, and the color to be matched appears in the other half. By means of sliding gelatin wedges which are colored red, blue, green, and neutral gray, the color primaries are subtracted from the white light until the other color is matched.

WOODEN-STAVE PIPING SHOWN TO BE FIRE-RESISTING

Creosoted wooden-stave piping, bound with galvanized steel wire, which formed part of a main, in Seattle, Wash., carrying water at a pressure of 125 lb. per square inch, was demonstrated by test to be fire-resisting. The test section, completely covered with fine kindling saturated with kerosene, was ignited.

The wiring expanded with the heat, and allowed the staves to separate, causing a leakage which extinguished the fire. As the wiring cooled, it contracted and drew the staves together again. In four hours the leakage had entirely stopped.



At the Top Is the Eyepiece, and Suspended from It Are the Sliding Scales Designated G, B, R, and N, Meaning Green, Blue, Red, and Neutral. Below Is the Cord Attachment for Any Light Socket

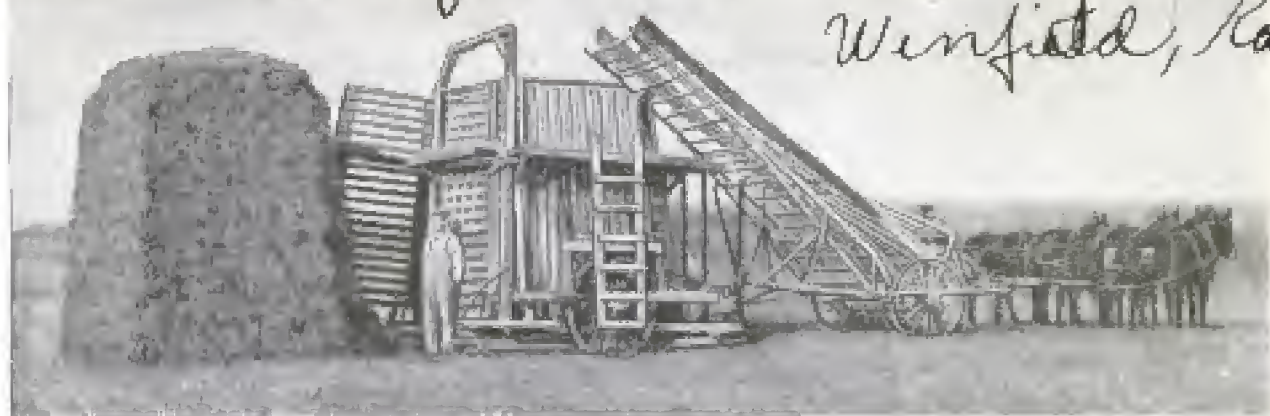
Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information.

The Engineer
10/14/21

Eastman Kodak Co., Rochester, N.Y.

7585 Russell Bros, Winfield, Kans.

POPULAR MECHANICS
and inquiries to Stanley Russell
Winfield, Kans



A Stack has just been Completed and Slipped Out of the Bin of the New Hay-Stacking Machine. One of the Rear Gates is Still Open, but the Nearer One has Swung Shut. The Sloping Sides of the Bin Give the Stack the Necessary Pitch to Shed Water When It Rains

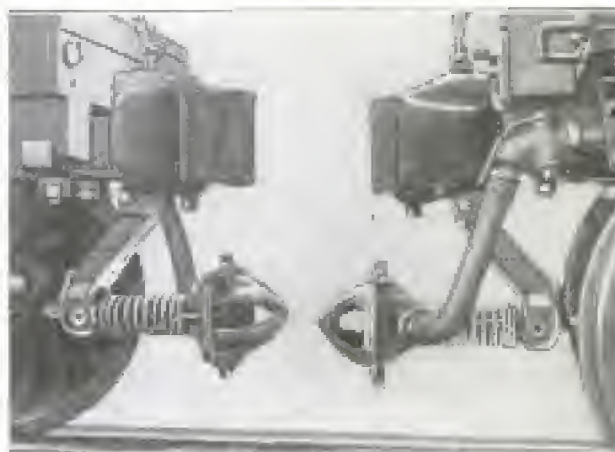
7585 HAY-STACKING MACHINE SAVES MUCH TIME AND LABOR

Harvesting hay is said to require only about one-fifth of the ordinary amount of labor with a new machine, operated by six horses and two men. The hay is picked from the ground and passed to the top of a bin by a conveyor. Three sides of the bin are solid, but the rear consists of two self-closing swinging doors. The bottom, carried 6 in. above the ground, is made of slats running lengthwise. When the bin is full, a trip lever releases a support at the rear of the bottom slats, allowing them to drop to the ground. Contact with the ground causes the stack to slip from the slats and push open the rear gates as the machine passes on. Springs return the slats to position when the stack is clear.

7393 AUTOMATIC HOSE COUPLERS FOR RAILROAD CARS

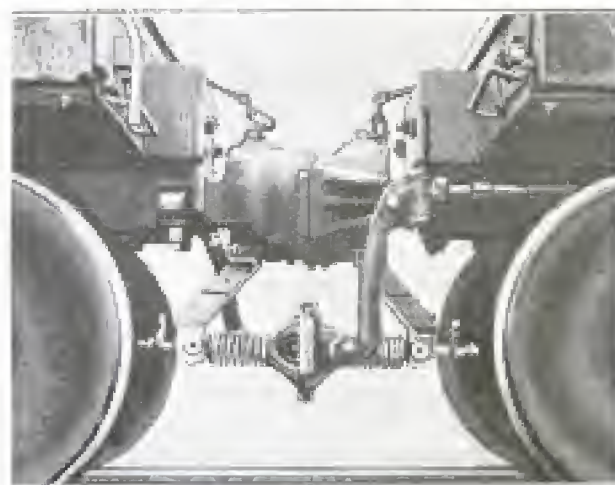
It is generally admitted that the present method of coupling by hand the hose on railroad cars is objectionable, if for no other reason, on account of its danger to the life and limb of the operator. Therefore it is not surprising that there are many attempts being made to couple the hose automatically in the same manner as the cars themselves are now coupled. An automatic hose coupler that has been submitted to long and very severe tests on several railroads, is of quite simple construction, and has points about it that resemble the present standard car coupler. It is attached to a lug that is cast, or welded, to the car coupler, making a permanent union with it. It consists of only six parts and weighs 50 lb. It is made for connecting the air hose

of freight cars, and on passenger cars to connect signal and steam as well as air. The one point where failure might occur is in the coil springs that keep the



Freight Cars Fitted with the Automatic Hose Couplers About to be Coupled by Impact. When Cars and Hose will be Coupled Simultaneously

couplings pressed together, and the construction is such that upon failure of one of these springs the coupling becomes



After the Impact, Showing the Freight Cars Coupled Automatically without Any of the Assistance from a Trainman That Is Necessary with the Ordinary Method

American Automatic Connector Co.
235 Railway Exchange Chicago

self-locking, and is not blown apart by the air pressure. This is demonstrated by connecting a coupling devoid of any springs. Under 120-lb. pressure the connection is maintained, and there is no air leakage.

A very interesting demonstration of this hose connector is made by a model, with a traveling track that moves at high speed, and subjects the coupling to the stresses of very sharp curves and steep grades.

6614 IMPROVEMENTS IN DETECTION AND IDENTIFICATION MEANS

Constantly, the methods of human identification, and also the analysis of handwriting, are becoming more and more precise. In



PHOTO BY COURTESY OF LA NATURE
The New Method That Permits Identification by Means of the 96 Sweat Pores Notated

connection with the Bertillon method of identification by means of finger prints, several recent developments have occurred, one of the latest being the inclusion of the sweat pores as an element of identification. Experiments

in this connection, in France, have shown that when these finger prints are examined under a microscope there are plainly seen a series of spots in single or double lines, which were formed on the print by drops of moisture from the sweat glands. The number of these dots varies from 9 to 18 to the centimeter (.4 in.), and their position, and even their shape, which may be either round, oval, or curvilinear, are absolutely characteristic in each individual. It is indisputable



Imprint of Sweat Pores on Forearm Used for Identification When Culpit Wears Gloves

therefore, that this is an exact method of identification, for the number and the disposition of these pores are constant in the same individual from the day of birth to death. Moreover, no matter in what manner the print is taken, whether with the finger flat or rolling, the pores have the same relative position and shape. These prints are not made with ink, but with dry graphite, or light powders, such as black oxide of copper or white lead. Besides taking direct prints, the finger tips are photographed by means of a microphotometric apparatus, and the photographic and direct prints are compared. The most striking feature in connection with this method of identification is that even when a malefactor has taken the precaution of wearing gloves, an imprint of any part of the wrist or arm is sufficient for identification.

As regards the detection of counterfeit handwriting a method has been worked out that is both mathematical and scientific. It has been applied to the detection of freehand forgeries—not those made by tracing or the changing of letters which are easy to detect. It is based on the hypothesis that everybody's handwriting shows certain constants that can be measured. This method is called graphometric, and on enlarged photographic reproductions measurements are made of the height of the letters, the trace of the curvature, the slope of the downstroke, and other details, and they are compared with standards that have been established by a study of the genuine handwriting.



In Lowest Tier Are Samples of Authentic Writing; Above Are Forgeries

Political candidates were given a chance to do their electioneering by wireless in a recent mayoralty contest in Pittsburgh, Pa. Persons possessing a radio outfit could hear the aspirants tell why they should be elected, without leaving home. Each candidate was allowed a five-minutes' speech at the sending station.

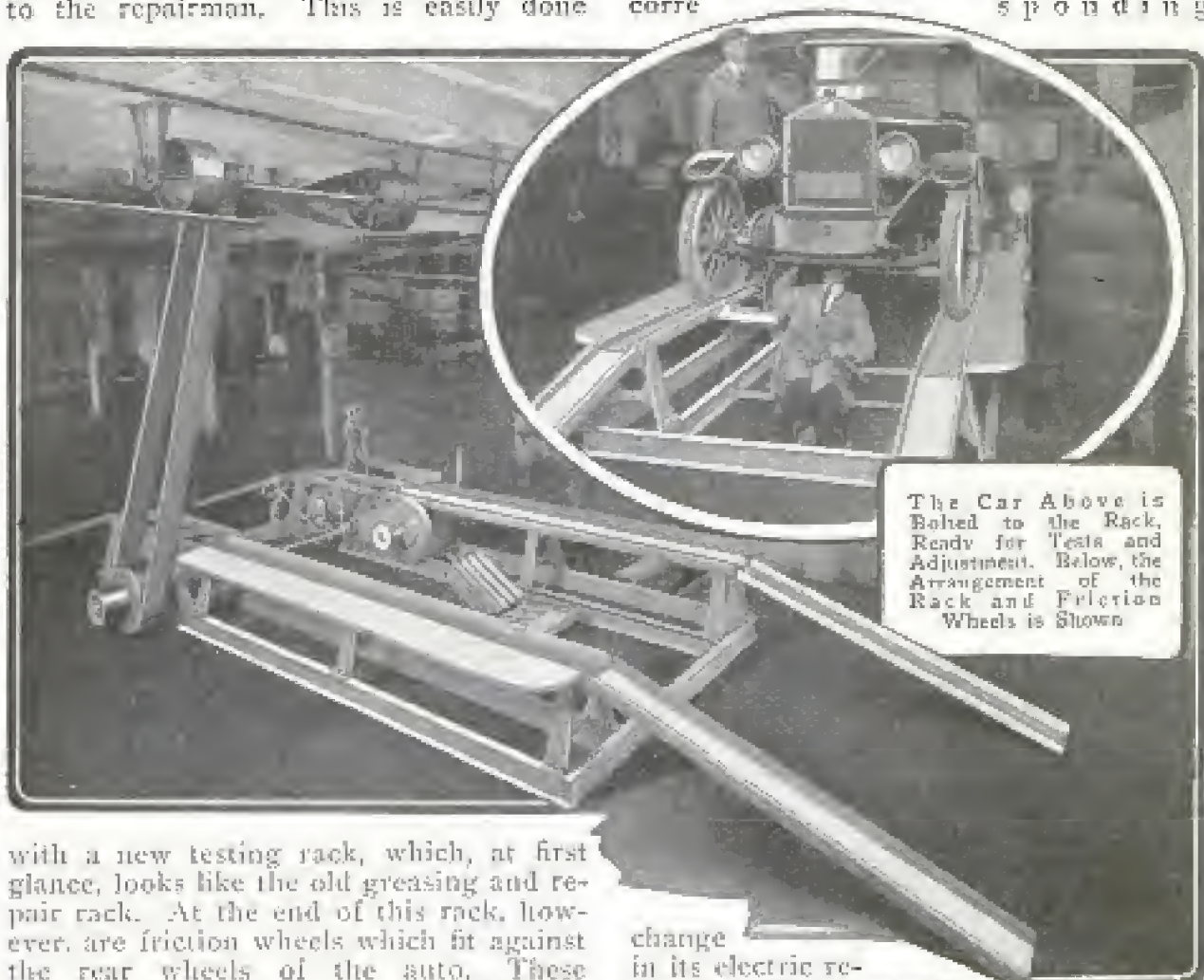
Developed by Dr. Legerd,
Director, Police Laboratory,
Lyon, France

7413 *Inventor, A. E. Johnson,*
Minneapolis, Minn.

POPULAR MECHANICS 73
Carl Arthur Hallam, 317 Cedar Av. Minneapolis
AUTOS GIVEN ROAD TEST
IN GARAGE

Giving a car a road test without taking it out of the garage is a great advantage to the repairman. This is easily done

and another box that holds a two-cell battery for furnishing the current. By the admission of more or less air into the furnace, the temperature of the oxidizing element varies, and therefore brings a corresponding

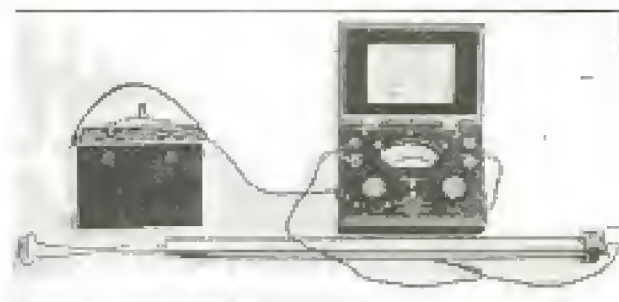


with a new testing rack, which, at first glance, looks like the old greasing and repair rack. At the end of this rack, however, are friction wheels which fit against the rear wheels of the auto. These wheels can be adjusted to give different resistances, so the equivalent of a regular road test can be given. Gauges are attached to indicate the mileage and horsepower developed. The friction wheels can also be connected to an electric motor, and the auto engine driven by this power, if desired.

7218 *Does*
INSTRUMENT RECORDS EFFECTS
OF AIR IN FURNACE GASES

A new instrument called an "oxyscope," now in use in England, indicates the oxidizing properties of the atmosphere in a furnace. It furnishes a means for determining the amount of air that should be admitted to the furnace so that the proper temperature may be maintained in processes of heat treatment of materials. There are three parts of the instrument: a mounting that holds the oxidizing element that is introduced into the furnace; an indicator box to which this is wired,

change in its electric resistance. This change is shown on the indicator box by a needle that deflects along a graduated arc, as in an ammeter. If observations of the position of the needle are made at regular intervals of about one-half minute, the deflections of the needle will tell the rate at which the oxidation progresses can be determined, showing the oxidizing properties of the furnace gases.



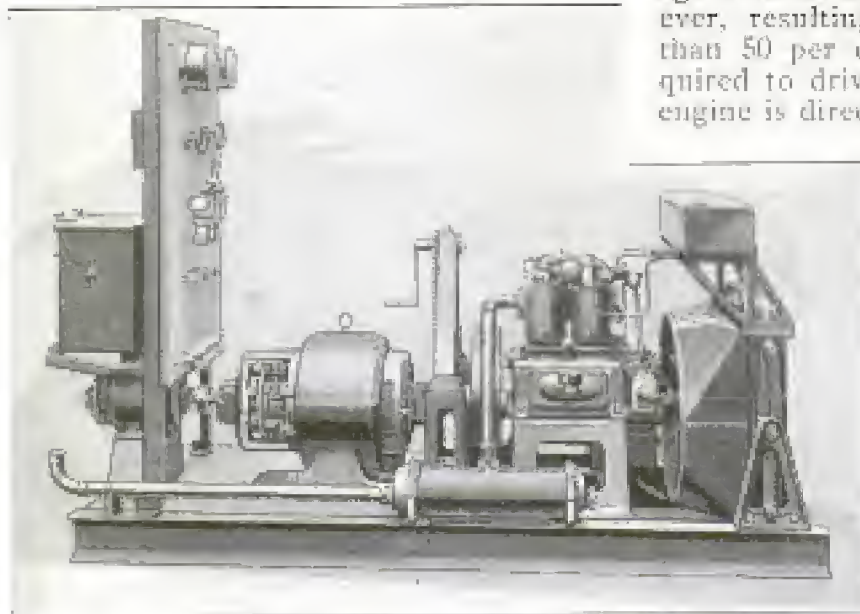
Instrument That Shows Oxidizing Properties of Furnace Gases: In Front Is the Oxidizing Member for Insertion in the Furnace, behind It, the Electric Indicator Box, and Also a Two-Cell Battery

Ind. & W. Co. Birmingham
England.

7145

ARC-WELDING OUTFIT HAS NOVEL CURRENT CONTROL

A compact, portable electric arc-welding outfit has been designed and built in



Electric-Welding Plant Which, with Switchboard, Dynamo, Rheostat, Reactance Coil, Gasoline Engine, and Its Accessories, Mounted on a Substantial Base, Forms a Very Compact and Easily Portable Outfit

England, which, it is stated, distributes the current at the required welding voltage without any mechanical control whatever, resulting in a reduction of more than 50 per cent of the horsepower required to drive the dynamo. A gasoline engine is direct-connected to the dynamo,

which is so constructed as to supply a constant current regulated by a variable rheostat. When used for welding, the dynamo is connected with the arc through a special reactance coil in the main circuit, which damps out any sudden rise in the current, and also helps momentarily to build up the current when any sudden break takes place. This plant, with switchboard, all mounted on a substantial base, weighs 2,800 pounds.

7486

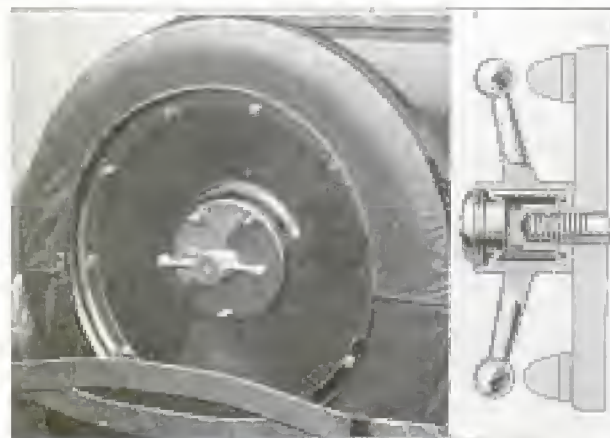
CARRIER LOCK FOR SPARE DISK OR WIRE WHEELS

Adequate protection against spare-wheel thieves is afforded by a new lock designed for use with wheels of the disk or wire type. This lock can be installed, with the aid of ordinary tools, on any spare-wheel carrier in a few minutes. It consists of three parts, a housing, with two wing arms, made of aluminum alloy and reinforced with a hardened steel insert, a combination locking nut and washer, fitting the threaded stud of the wheel carrier, and a removable, nonpick-

able, dust-proof lock, which fits into the outer end of the housing. Two movable lugs, inside, engage a flange and hold the lock in place. The device can be quickly unlocked, by means of a key, and the wheel dismounted.

HIGHEST RAILROAD OF BRITISH EMPIRE TO CROSS RICH REGION

The highest summit level of any railroad in the British Empire, 9,135 ft., will be attained by a new 150-mile line about to be built from Nakuru to Turbo, in British East Africa. Cutting through the heart of a rich agricultural plateau and extensive timber lands, it will form a part of a great trunk route from Mombasa on the Indian Ocean to Uganda and the Congo. Later, when the Cape-to-Cairo project becomes a reality, it will be one of the ribs of this route. The rise from Turbo, the lowest point on the line, to the summit will be 3,215 ft. Only 14 per cent of the line will be on the level, and 48½ per cent of it will consist of curves. Construction work is expected to occupy three years. The plan is to maintain an unskilled labor force of 10,000 natives. The cost will be about \$10,000,000, according to present estimates, though in view of falling prices, this figure may prove to be too large.



Left: A Disk Wheel Locked onto the Carrier with the New Lock. Right: Detail of Lock Construction, Showing the Barrel-Shaped Lock Housing

Clarke Co., Indianapolis, Ind.

7280 Cmt. C. W. Isinger

Press Club San Francisco
POPULAR MECHANICS Calif. 75



Left: The Upper Berth is Raised against the Top and the Lower Berth Folded Up like a Davenport, Ready for Travel. Right: The Lower Berth Opened and the Upper Berth Lowered in Preparation for Sleeping

7280 BERTHS ADD TO THE COMFORT OF AUTOMOBILE TOURING

A berth arrangement built into the rear of an automobile used for extensive touring affords two comfortable beds, but does not take up an unnecessary amount of space when not in use. One berth is built like a davenport against the back of the car. The other is supported against the top by hooks, during the day, and at night is lowered in a manner similar to a sleeping-car berth. In order to provide ventilation for the upper berth, the rear window of the car extends above the berth when it is lowered. A special bathtub is carried in a compartment under the lower berth.

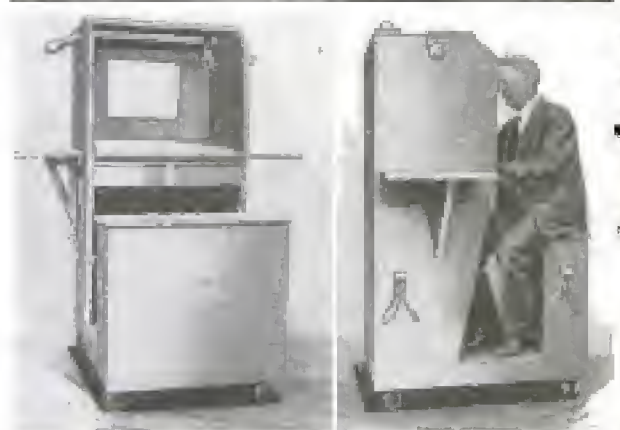
7602 WILD GESE ARE ELECTROCUTED IN VIOLENT ELECTRIC STORM

Although it did not "rain pitchforks," or "cats and dogs," a recent electric storm near Seattle, Wash., was featured by the queer occurrence of "raining geese." After an unusually dazzling flash of lightning, followed by a loud clap of thunder, great numbers of wild geese fell to the ground. Passers-by and residents of the vicinity took advantage of the phenomenon and immediately gathered up the fowl, which were dead and without a mark of any kind upon their bodies to indicate the manner of their death.

Rea Gilbert
40 Jefferson Co. Dan Allen,
Ohio.

7528 PORTABLE EXPRESS OFFICE FOR FAIRS AND EXHIBITS

For convenience in handling shipments at fairs and exhibits, an expressman has introduced a portable booth, to be used as an express office. Being equipped with small wheels, it can be readily pushed where needed, and if the going proves too rough, brackets, into which handles may be slipped, are provided for carrying it. The booth is fitted with a drawer for supplies, a seat for the expressman, and also a collapsible writing shelf on each side for the shippers' use. Wiring and fixtures for electric lights, with a simple



Two Views of the Portable Express Office, Showing How It Appears from the Rear and from the Side

connection which can be attached to any light socket, are also installed.

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327 Mc Donough St.
Brooklyn, N.Y.
W. Todd.
Stanley W. Todd.

Cambridge + Paul Instrument Co

76 45 7318 18
Krasnoyarsk Place
POPULAR MECHANICS
London, S.W. 1, England

**CARBON DIOXIDE IS MEASURED
BY ELECTRICAL INDICATOR**

An instrument for measuring the percentage of carbon dioxide in flue gases, is being manufactured in Europe. Two coils of platinum wire, of the same size, are inclosed in separate gas-filled cells in

a metal block. Each coil is connected to form one arm of a Wheatstone-bridge circuit, and when an electric current is allowed to flow in the circuit the coils become heated. Heat is conducted through some gases more

readily than others, and when one of the cells is filled with pure gas, and the other with the flue gas to be examined, the difference in radiation of the two cells determines the percentage of carbon dioxide in the flue gas. This percentage is proportional to the deflection of the galvanometer needle, and it is a simple matter to calibrate the galvanometer scale so that it indicates this percentage directly without calculations.



**MICROMETER GIVES METRIC
AS WELL AS INCH READINGS**

Both inch and metric readings can be made simultaneously on a micrometer that has been introduced in England. On the stem of the micrometer, besides the usual inch graduations, there is another line of graduations with metric divisions that spirals once around the stem without crossing the inch graduations. On the thimble is the ordinary set of graduations for reading the inch measurements, and a second set for the metric readings.

74 86
**NEW FARM TRACTORS HAVE
THREE-WHEEL DRIVE**

Three-wheel-drive farm tractors, built by a middle-western concern, are credited with a number of advantages by the makers. Power, from a 35-hp. motor, is applied equally to the single front wheel and the two rear wheels. A swivel joint on the front wheel allows the tractor to make a very short turn and plow well into the corners of a field. Power on the front wheel is said to increase the efficiency of the machine, particularly in climbing hills, pulling out of ditches, and working over soft ground. A belt pulley, operated independently of the driving mechanism, does not drag on the power supply when not in use. Steering controls may be operated either by hand or by power.



Plowing with the New Three-Wheel-Drive Farm Tractor: The Plows are Set Directly below the Driver's Seat So He can Observe Their Action and Place Any Part of the Tractor's Weight on Them. The Depth can be Regulated from Two to Fourteen Inches

Three Wheel Drive Tractor Co.
5 E. Market St. R. 206 Indianapolis Ind.

The Engineer 10/14/21



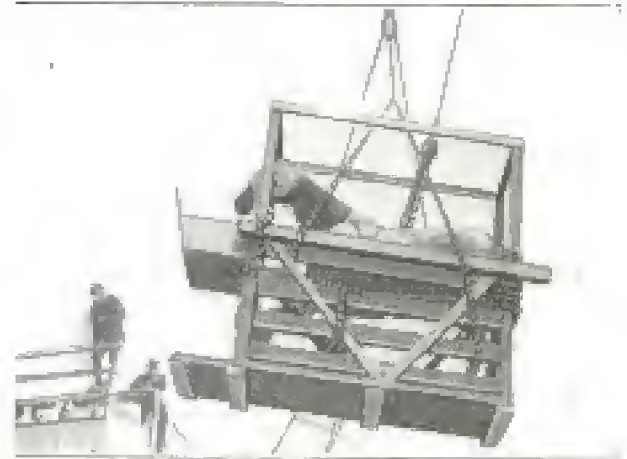
At the Left are Shown the Stall, or Crate, and the Derrick Cables with Which the Crate was Hoisted aboard Ship. Before the Horse could be Induced to Enter the Crate, His Head had to be Covered with a Sack

CRANKSHAFT AND PISTON JIG OF UNIVERSAL QUALITIES

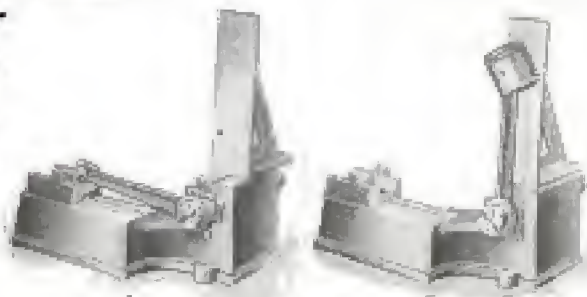
HORSE TAKEN ABOARD STEAMER IN SPECIAL STALL

Those interested in automotive repairing will welcome a universal jig to be used in the alignment of crankshafts and pistons. The jig has three arbors, or shafts, all of the same size in the middle, but whose ends are cut down to standard crankshaft sizes, each end containing two sizes, so that 12 sizes of crankshaft can be accommodated. A sliding block at one end, to provide for different-length pistons, and a square at the other end, both move on accurate planes and are held in place by a tongue-and-groove arrangement. The total weight of the jig is 125 lb., and it is made so that it can be bolted solidly to a bench. It is claimed that this tool will handle more than 90 per cent of the truck and automobile crankshafts now made.

Horses are notoriously nervous and object to boarding cars or ships. So, when a thoroughbred animal was to be taken aboard the liner "Empire State," at



This Shows the Crate and Horse in Mid-Air as the Animal was being Lifted Bodily aboard the Ship. The Sack is Still Tied over the Eyes of the Horse



Left: Piston Shown Placed on Sliding Block. Right: Piston Alignment by Sliding Square

San Francisco, Calif., for a trip across the Pacific, a stall had to be provided for it. A light box stall was built on shore, and the horse was driven into it blindfolded. Then, with the horse in it, it was hoisted aboard the ship. Because the stevedores had difficulty in getting the horse into his stall, the sailing of the vessel was delayed for some little time.

Wm. J. J. Hendricks
Seattle, Wash.

748 4
78

Auto

POPULAR MECHANICS

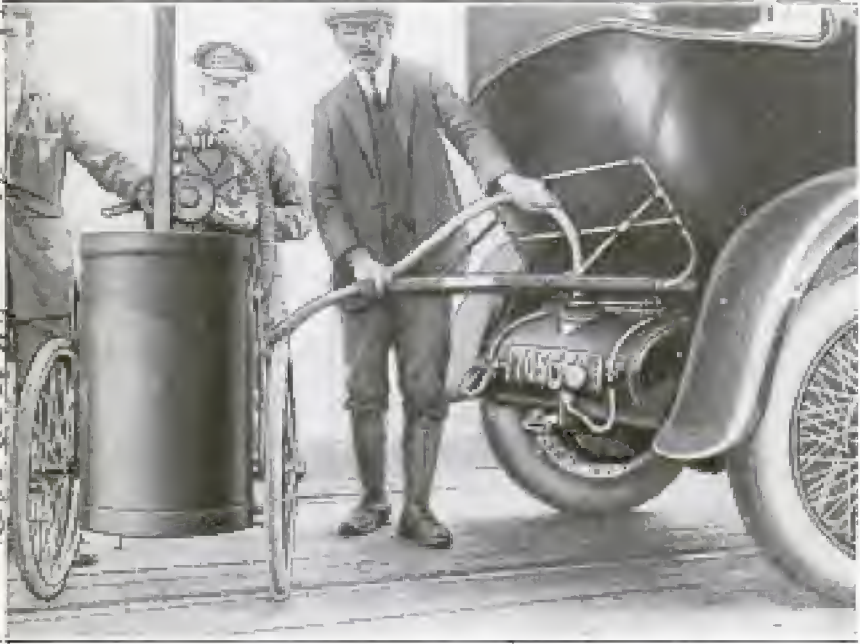
Confectionery + Allied Industries Exhibit, 2nd floor, Wrigley Bldg Chicago
PERMANENT EXPOSITION
FOR CANDY INDUSTRY

SUCTION PUMPS EMPTY MOTOR GAS TANKS BEFORE SHIPPING

Tanks, equipped with suction pumps, are being provided by the British automo-

759 4

Candy makers and manufacturers of candy-making machinery have rented the entire second floor of a large Chicago office building, and are conducting a permanent exhibit for the benefit of the wholesale buyer, the retailer, and the manufacturer of any kind of "sweet-tooth" goods. Here, the prospective buyer of candies, or of machinery to make the same, may come, and be saved the tiresome task of going about the city, or the more costly one of traveling around the country, to look at the displays of the many manufacturers. The various kinds of machinery used to supply the American public with their favorite sweets, are shown here in an amaz-



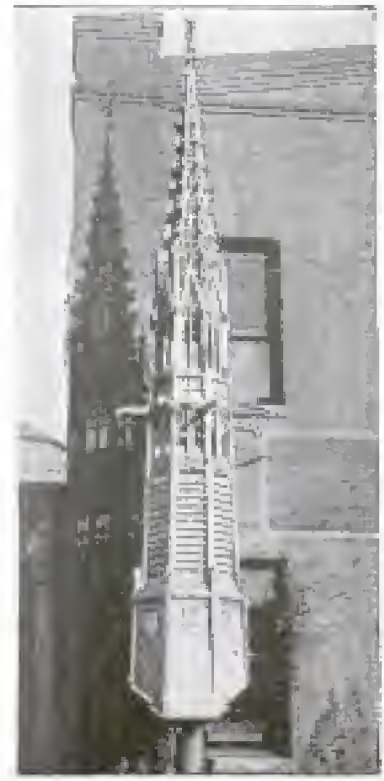
Emptying the Gasoline Tank of an Automobile to be Taken aboard Ship at Folkstone, England: These Suction-Pump Tanks are Mounted on Rubber-Tired Wheels and are Easily Moved about the Docks

ing association and motor union to empty the gasoline tanks of automobiles about to be taken aboard ships at British ports. The shipping authorities require that all tanks must be drained before motors can be shipped. When tanks are drained from the bottom, in the usual way, the gasoline is often spilled, with dangerous results, and the new pumps are for the purpose of avoiding this danger.

ing array, and anything from the penny "all-day sucker" to the glistening soda-fountain fixtures, may be purchased at the exhibit.

74 5 6
ORNAMENTAL BRONZE TOWER FOR MEMORIAL CHAPEL

An ornamental bronze tower, 25 ft. in height, is the product of a Minneapolis firm, and will be shipped to St. Louis, to be mounted upon a memorial chapel there. Although the tower is composed of many pieces, the joints and rivets are seen only from the inside. Thus the work appears to be a solid piece of bronze.



76 15
CHINESE PRINCE IS AFRAID TO RIDE IN AUTOMOBILE

In sharp contrast to the establishing of an 800-mile mail and passenger-airplane service by China, and its interest in other modern activities, is the experience of a party of Americans on a trip from Peking to the Ming Eastern Tombs by automobile. A Manchu prince, who met them at the tombs, was greatly frightened when the American automobile, the first he had ever seen, appeared. He could not overcome his terror sufficiently to accept an invitation to ride, and withdrew to a safe distance. The members of his bodyguard, armed with broad-swords and even bows and arrows, were both terrified and fascinated by the car.

Our Bureau of Information is for your benefit. Use it as often as you please.

Ornamental Iron & Bronze Co., Minneapolis, Minn.

*Publicity from Foreign Press. 7615
Lead Agency, 157 Fleet St. E.C. London, England*

Capt. H. E. Zimmerman
7264 266th Independence Ave
Kansas City, Mo



Arsenic-Refining Plant at the Little Town of Brinton, Virginia, Which has Grown Up around It as a Result of This Activity: This Is the Only Refinery in the United States, and Perhaps in the World, That is Operated Primarily for the Production of Arsenic, Which Is Usually a By-Product of Minerals

MINING AND REFINING ARSENIC IN VIRGINIA

BY PHIL W. HANNA

SEVERAL years ago, a farmer in the foothills of the Blue Ridge Mountains, in Virginia, cleared a new field for pasture. Before long his cattle became sick and one of them died. Thinking that the trouble might be caused by the water from a spring in the field, he had it analyzed. It was found to contain a large amount of arsenic, and the discovery resulted in the development of an arsenic mine and refining plant. This plant, at the little town of Brinton which has grown up about it, is the only one in the United States, if not in the world, which is operated primarily for the production of arsenic. Other refineries produce it as a by-product in refining silver, antimony, and a number of other ores. Most of those in this country are located in the mining districts of Utah and Montana. The arsenic usually appears in the ores in combination with iron as a pyrite called arsenopyrite. Pure arsenic is a steel-gray metallic substance, but it is better known in the form of an oxide, the white arsenic usually produced by the refineries.

At Brinton the ore is found in many small veins, through a gray mica-quartz formation. When taken from the mine, it is put through a crusher and then placed in an iron tube, 50 ft. long and 6 ft.

high, known as a calciner. Here it is subjected to a heat of 800° F. for 45 minutes. The resulting gases deposit the arsenic, in the form of arsenious oxide, on baffle plates in a flue, 319 ft. long, which leads from the calciner and ends in a tall stack. The deposit, a dirty-gray powder full of impurities, is then placed in a refining furnace which volatilizes 1,400 lb. in about 2½ hours, producing the pure oxide. This is ground to a powder and placed in barrels by an automatic machine, after which it is ready for shipment.

White arsenic, as this arsenious-oxide product is called, is used chiefly in the manufacture of glass, for making insecticides such as Paris green and poison fly paper, for weed-killing compounds, for a sheep dip, and for medical purposes. It was formerly used extensively in a copper compound for coloring wall paper, cloth, and toys, but has been replaced by other less dangerous coloring matter for these purposes. Contrary to what might be expected, work in the arsenic mine or refinery has no ill effect on the workmen. In fact employees seem to be benefited physically by service in the refinery.

Though arsenic is poisonous, both in the metallic form and in most of its com-

Brinton Arsenic Co., Brinton, A. Lloyd Co., Va.

pounds; a relatively large amount must be taken to be really dangerous. Arsenic poisoning results in irritation of the eyes, soreness of the mouth, skin eruptions,



White Arsenic or Arsenious Oxide Piled Up Waiting to be Barreled, at the Brinton Refinery; This White Powder Is the Form in Which Arsenic is Usually Obtained for Commercial Purposes

7525

Access

CIGAR LIGHTER FOR AUTOISTS WINDS UP ON SPRING REEL

The drivers of motor cars will welcome a handy electric lighter, which is now



This Shows the Cigar Lighter being Used With One Hand without Removing the Other from the Steering Wheel. When the Lighter is Released, the Cord Winds Up on a Spring Reel

on the market as an automobile accessory. The autoist needs use only one

spasms, vomiting, and even paralysis. Taken in small doses, a tolerance for it can be established. Some people, notably the Styrians of Austria, develop the arsenic-eating habit, which is said to result in increased weight, strength, and appetite, and a clear complexion. It is often given to horses, in Europe, to improve their coats and make them plump and spirited. It is this quality which makes it valuable as a medicine in treating anemia and dyspepsia, its principal medicinal use. It is also used for certain skin diseases. Great care must be taken in prescribing it, as its effect on different individuals varies greatly.

About 10,000 tons of arsenic are used annually in the United States. Of this amount about 4,000 tons are imported. Most of the imported arsenic comes from Canada, Mexico, and Belgium, but small amounts are also obtained from England, France, and Germany.

hand in lighting his cigar, and after being used, the appliance winds itself up on a spring reel.

NEW AIR-CRAFT FITTINGS AND WHAT THEY ARE MADE OF

Steel shapes or fittings, required in the modern airplane to hold its various parts together, show the new demands which an invention may make, and to supply which the ingenuity of scientists and skilled men of various industries is demanded. Air-craft fittings made of steel, to be used on large machines, such as the NC's of transatlantic fame, are typical of the many structural parts which are used to connect, support, and reinforce the members of modern airplanes. Early airplane fittings were made from low-carbon sheet steel or a grade of mild alloy steel. The new giant planes, however, require a steel of high tensile strength, to avoid excessive thickness and weight. Steel of a tensile strength of 150,000 lb. per square inch is necessary.



Airplane Wing Beam Hinges, in Various Stages of Completion, are Shown at the Left. The Smaller Forms at the Right Are Parts of a Box Fitting. After Welding, These Forms are Dip-Brazed and Heat-Treated. They must Have Great Strength and Resiliency, the Box Fitting, for Example, Carrying the Stresses from 10 Timbers

Cont. E. J. Cone, 8 Ash Street
Flushing, N.Y.

It has been found that steel having about one per cent of chromium and less than a quarter of one per cent of vanadium meets the requirements. Such a steel can be rolled successfully into sheets of the proper thickness and pliability to make the shapes, and at the same time of sufficient strength to withstand the tremendous strains to which they are subjected.

ARCH OF BRIDGE IS ERECTED WITHIN TWENTY-FIVE DAYS

Great speed in construction was attained in the building of a 97-ft. concrete arch for a bridge in Maryland recently. The bridge spans the Little Patuxent River, near Savage, and carries the heavy traffic of the Washington Boulevard, which runs from Baltimore to Washington, D. C. Being a steel structure originally, it was wrecked by the driver of a heavily loaded five-ton truck, who disregarded the "One-Way-Bridge" signs, and attempted to pass a small car on the bridge. The two vehicles collided, which resulted in the tearing out of enough of the side supports of the structure, to allow it to collapse in the river. The State Roads Commission met the next day and called for bids on the cost of replacing the wrecked arch, and within 30 days' time, the contract was awarded at a figure of \$19,000, and work was started in five days after the accident. The wrecked steel arch was replaced by one of concrete, in 25 days, and the feat is considered quite an achievement in bridge construction.

NEW ICE-CREAM MACHINES ARE SANITARY AND ECONOMICAL

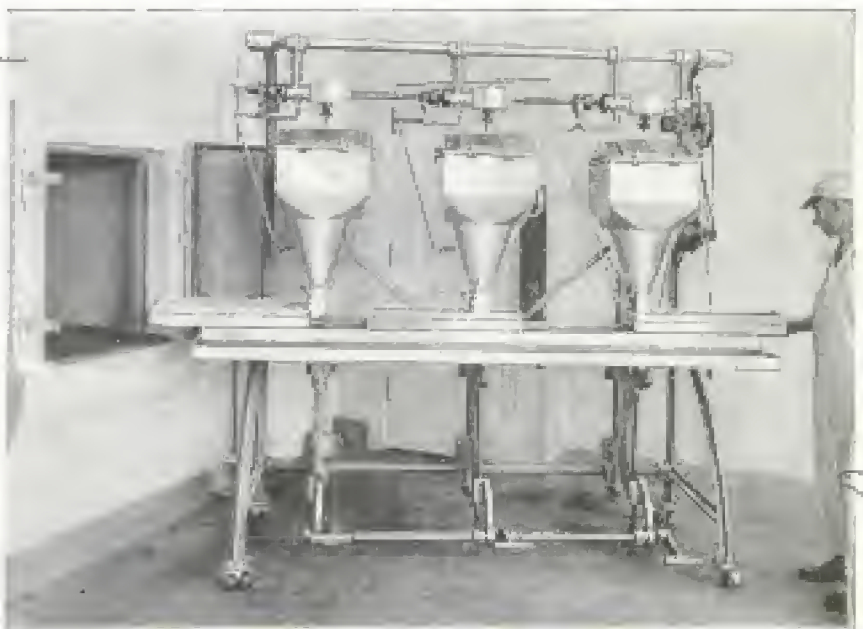
Two new machines, for use in the manufacture of ice cream, greatly aid sanitation as well as increase the speed of production. One of them replaces the old hand method of making brick ice cream, turning out the molds without the touch of human hands. It can be adjusted for any size of brick, made in from one to three flavors. The capacity is 20 gal. of plain, or 12 gal. of three-

layer brick, a minute. Layers produced by it are always equal in thickness and separated by a straight, even line, mak-



For Packing Ice-Cream Tubs with This Machine Only One Man is Required. There is No Heavy Labor and the Packing is Done Very Rapidly

ing a more beautiful brick than was possible by hand methods. The second machine is for packing tubs. Ice is crushed in a hopper, by an electrically operated rotary cutter, and delivered to the tubs with any desired proportion of salt, by moving a lever. This device has packed 199 tubs in an hour, with only one man to attend it. Formerly six men would have been required for this job.



Perfect Ice-Cream Bricks of from One to Three Flavors are Turned Out by This Machine without having been Touched by Human Hands. It is More Sanitary and Rapid Than the Old Hand Method and Makes Layers of Equal Proportions

Inventors E. R. Myers &
Les. W. Burk, Portland, Ore.

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Eng. News-Record 11/3/21

Eng. News-Record 11/3/21

Glass Casket Co

82

Altoona, Pa.

POPULAR MECHANICS

BURIAL CASKETS MADE OF CLEAR GLASS

Several unusual features have been combined in the manufacture of clear-



Showing a Transparent-Glass Casket That is Made Strong Enough to Hold the Combined Weight of Three Ordinary Men When Supported Only at the Extreme Ends

glass caskets, which is now an established industry. They are made strong enough to support three ordinary men standing upright in them, and the weight of both the bowl and cover of the casket is claimed to be only 260 lb. for a 6-ft.-3-in. model. Although additional weight is, of course, added in the way of trimmings, the glass casket has been found to be

Industrial Research Laboratories Building

10/24/21

lighter than most of the metallic makes on the market. Glass is practically imperishable, and when made as strong as these caskets and hermetically sealed, should be proof against any underground elements.

76/6

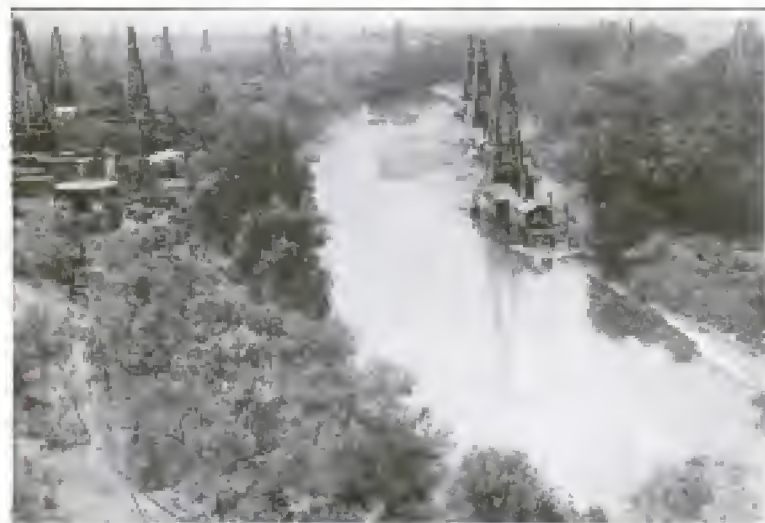
ENDLESS CHAIN OF POISON. KILLS RATS IN EUROPE

Rats are being destroyed in Europe by a novel method which is said to be the only hope of finally exterminating these pests. A poisonous powder is mixed with plaster of Paris and lard, to form a paste. This is placed on the inside of rat holes and sticks to the animals' fur as they pass. When the rat licks its fur it dies. Because rats eat their dead, its carcass kills others, establishing an endless chain of destruction.

7561

CONCRETE BASES FOR DERRICKS NEEDED IN TEXAS OIL FIELD

Nine-foot concrete bases, or piers, were built to hold the derricks while drilling certain oil wells in Texas recently. The wells were drilled in the bed of the Clear Fork, which is a tributary of the Brazos River. Most of the time, the bed is almost dry, but occasionally heavy rains make it a raging torrent of water. To withstand these flood waters, the concrete piers were built, and have successfully resisted them, although a bridge located a short distance upstream was completely washed away. Special permits had to be obtained from the state in order to drill the wells in a waterway, and the state receives a royalty on the production.



At the Left is Seen the River Bed as It Looks from an Airplane and with Considerable Water in It, and at the Right, When Practically Dry; Here the Concrete Bases of the Derricks are Seen

Carl E. Reed, Box 707, Irahah, Texas

Copyrighted material

Owner. Fred Toward
Los Angeles, Calif.

PROSPEROUS STOVE BUSINESS FROM SALVAGE

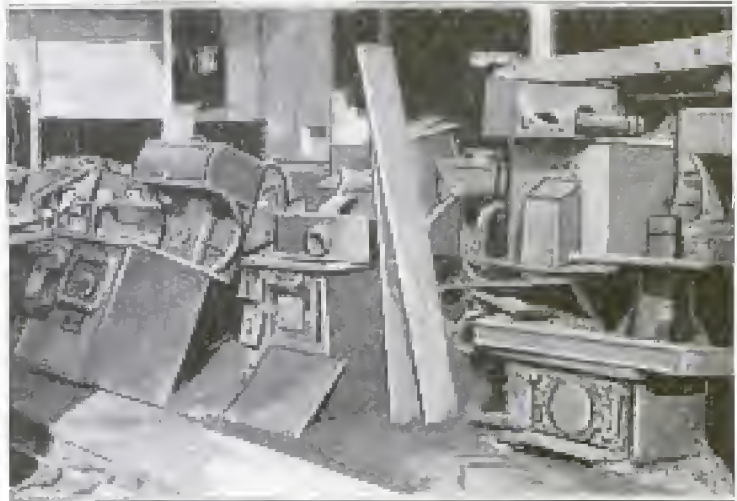
By CHARLES A. GODDARD

5226 Charington
Place Los Angeles, Calif.

EVERY day there is dumped onto a lot in a section of Los Angeles one or more ranges or stoves that offer but little promise except to the junk man. To the casual observer the rusty, bent, and broken old ranges are hopeless derelicts. To one Californian, however, they have been the means of building up a business that began with less than a shoe-string, but which today sells over 4,000 ranges a year, besides gas and water heaters, oil stoves, water tanks, lawn mowers, and many large hotel and restaurant ranges. By rebuilding what others relegated to the junk pile, this man has reached this volume of business within five years.

The business began in 1916, when, after having failed in the hardware business in the East, he started to repair lawn mowers, stoves, and ranges. As he gradually accumulated some of these, it was necessary to find a market for them, and the idea of selling rebuilt goods in these lines came to him. Prices of the new goods were high then, and the articles sometimes hard to get. Developing

the business to the point where he could afford to employ expert welders, sheet-



Junk to All Appearances, but Each of These Old Ranges will Either be Rebuilt into a Serviceable Piece of Merchandise or will Furnish Parts to Help Put Others into Salable Condition



These Rows of Rebuilt Ranges Present a Striking Contrast to the Dilapidated Ones Shown in the First Picture

metal and other workers, he began to gather up the derelicts from various sources. A great number came from large downtown stores which followed the common policy of accepting old ranges or stoves as part payment for new ones. As

the business increased, many came to the plant through the trading-in plan.

A representative of the establishment visits the home where one is offered, and after examining it, proposes a price. If accepted, the range is picked up, with many others, in a truck, and on arrival examined by the experts of the plant. If the body of the range or stove is in good shape, it is scheduled for rebuilding. A new grate in a heater, an oven in a range, or some other repair, in many cases will put the article in condition to give years of satisfactory service. A "prescription" is prepared for it. The first operation is a chemical bath, given by lowering the stove or range by means of a crane into a metal vat. This removes



Section of the Plant Where Water Tanks and Heaters are Salvaged; Parts of Stoves and Ranges Which Are Still Good are Saved to Replace Worn-Out Parts in Others

rust and the greases accumulated in its years of use.

After that, the experts remove the worn parts and install new ones. When it leaves the rebuilders it is, save for appearance, a new article. This defect the finishers remedy, for they are prepared to finish its nickel and steel parts in a way to compare with the new. It may be that a range will come into the plant that is almost a total wreck; although to the plant there is no total loss. If putting it into satisfactory shape would mean practically building a new range or stove, the course of economy is followed: It is stripped of such parts as are in satisfactory condition. These are then cleaned, labeled, and sorted into the proper tills of a series of large 2-by-2-ft. pigeonholes, numbering 375 in total. The plant carries parts for every known American range or stove. Thus stripped of serviceable parts, the worn range or stove is set out to go to the junk pile for what slight revenue it will bring.

One part of these junked ranges that

finds ready service is the top and burners. With the body of the range hopeless for service, the top still can be made into a demanded article—the gas plate. These range from single burners for light house-keeping to long plates, such as restaurants use, burners from many old ranges going to make the latter.

Where the owner of an old range may place its valuation at a very low figure because of its looks and some slight handicap, the same range, refinished and repaired to produce satisfactory service, brings a good price.

Lawn mowers are handled in the same way, and a stroll through the department assigned to them is an exposition of the various makes that are for sale in this country. Hot-water tanks are corded as stove wood. Each old one is opened and the extent of the wear learned. If not too far gone, it gets a new bottom, or so, and is put up for sale. Tank heaters are also sold in large numbers, after being rebuilt and fitted to new or repaired tanks.

7399

FLOORED SCOW DOES DUTY AS MOTOR-CAR FERRY

When the owner of an automobile wished to take his machine to Westport, N. B., recently, he was forced to improvise a special ferryboat. Westport is on an island about a mile from the mainland. There are no machines on the island, and the only means of reaching it is by a motorboat ferry. A scow was obtained, floored over, and the machine run onto it. The regular ferry then towed it across. The machine was run off the scow onto the shore on planking, and for the first time a motor car appeared on the island.

7684

OX OF GIGANTIC PROPORTIONS EXHIBITED IN AUSTRALIA

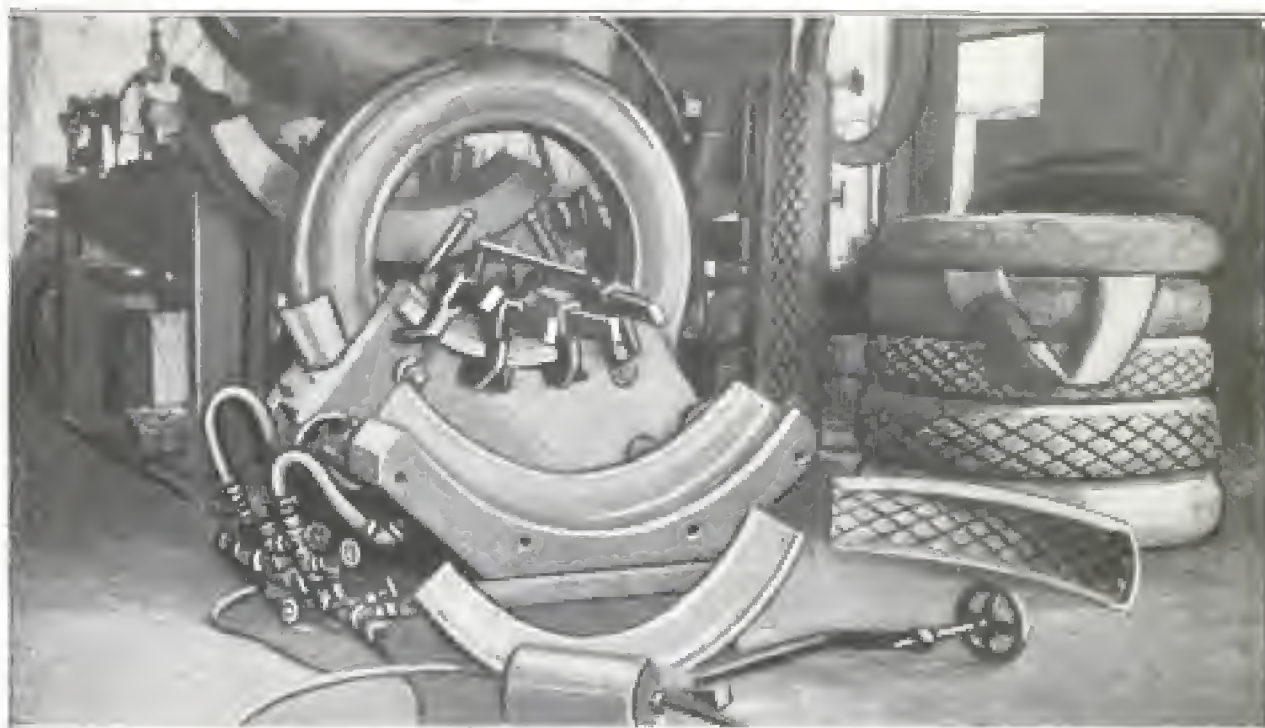
An ox of gigantic proportions was exhibited last April at the Royal Sydney Show, in Australia. It was a seven-year-old, and stood 6 ft. 4 in. high. It had a girth of 14 ft. behind the shoulders, and weighed 3,700 lb. It came from New Zealand, and had arrived some days before the opening of the show. It was well proportioned in the forequarters, but its hindquarters were not nearly so robust. The Royal Sydney is one of the greatest agricultural shows in the world.

Illustration 7/2/21



At the Left: Poling the Scow Automobile Ferry to Shore after Crossing to the Island. Right: The Scow, with Its Load, was Towed across the Harbor by the Small Launch Which is Used as a Passenger Ferry

Ont. S. S. Payson
 71 Caroline St.
 S. R. John, N.B. Canada.



Adjustable Mold, with Interchangeable Tread Plates in the Base. That Makes Repairs on Any Size or Shape of Pneumatic Tire: Bolts Hold the Three Main Parts of the Mold Together, and are Used to Adjust It to Any Required Width. The Tire is Compressed in the Mold by Pressure on the Sandbag Plate

ADJUSTABLE MOLD SIMPLIFIES PNEUMATIC-TIRE REPAIRS

In pneumatic tires for automobiles, and especially in those for trucks, there is considerable variation in dimensions, even in cases where, made by different manufacturers, they are nominally of the same size. Therefore, in repair work on these tires, to make correct vulcanizing possible, a newly patented adjustable tire mold that will take care of tires of any shape or size, should be very helpful. It will do retread vulcanizing of any kind by means of tread plates which are interchangeable in the base of the mold. The latter is made in three parts used to adjust, by bolts, the mold sides to any width desired.

FEW REAL "SLACKERS" OF MANY LISTED AS DRAFT EVADERS

Out of a list of nearly 10,000 names, submitted by the War Department to the United States district attorney in New York City, of persons supposed to be draft evaders, 3,000 cases have been investigated and only nine have proved to be cases of actual draft evasion. The lists included all persons registered for the draft who failed to send in their questionnaires. Many of those listed have not been found, and many others had served in the army or navy. Some even lost their lives in the service.

N.Y. Times 11/8/21
P. 1

OLD DUTCH WINDMILL MODEL FOR LOS ANGELES STORE

Advertising by means of unusual and picturesque architecture for store and shop buildings has become quite popular in many places. One example of this, the branch store of a Los Angeles bakery, which was built this fall, is a copy of an old Dutch windmill, a trade-mark of the firm. The store is a complete duplication, from the great clumsy wind vanes to the unevenly laid shingles which cover the dome-like roof. Light and dark shades of Dutch blue, used in painting the building, add to the picturesque effect. The interior is equipped with the necessary counters and showcases, to make a complete little retail store.

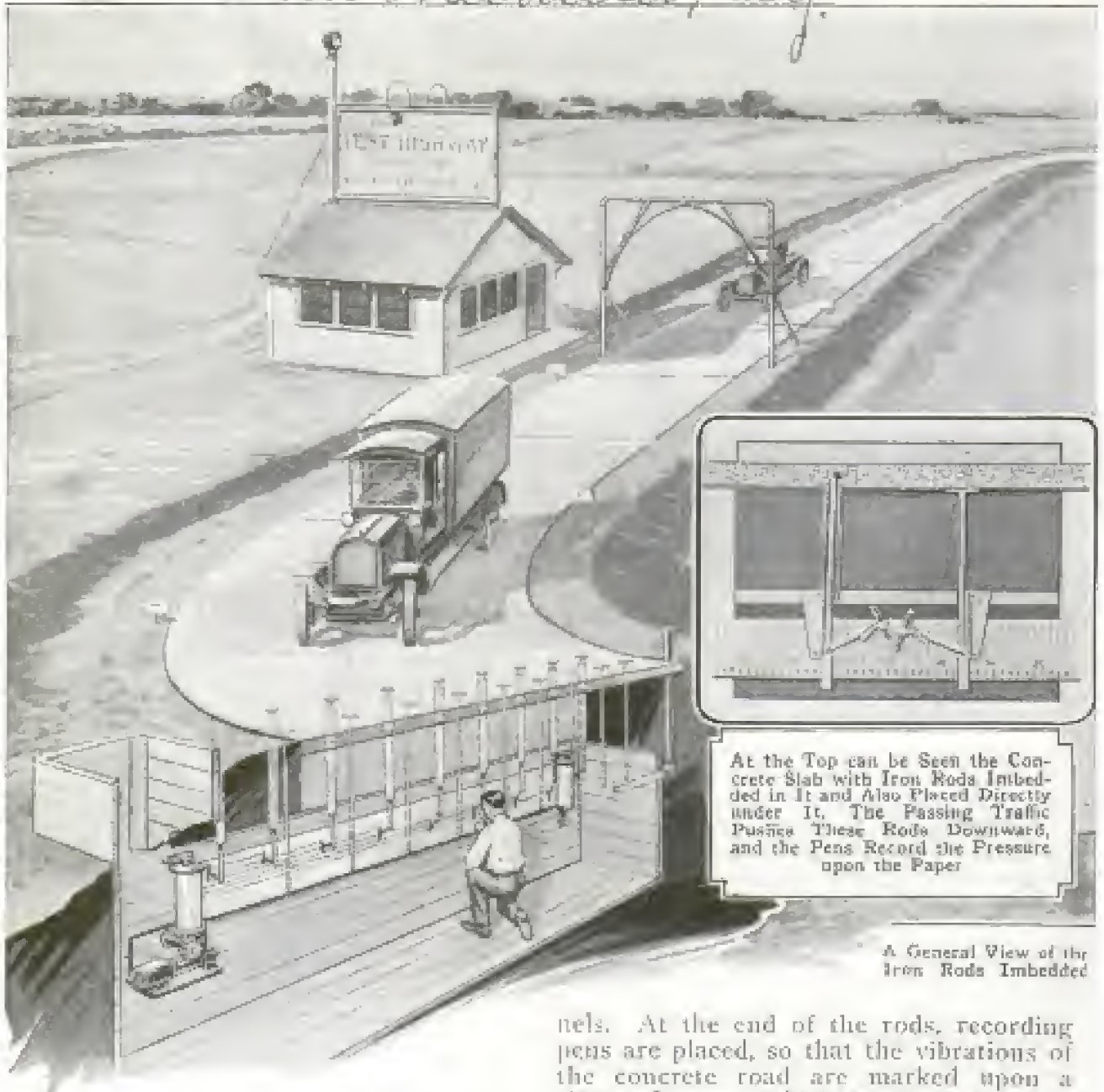


Store in Los Angeles That Attracts Attention for Advertising Purposes by Its Unusual Architecture: It Is a Reproduction of an Old Dutch Windmill

Vande Kamp's Holland Bakery, 207 Verdine
Los Angeles, Calif.

7457
 Cnt. Charles Esinger e/s Press Club.
 Powell + Sutter
 San Francisco, Calif.
 ELABORATE HIGHWAY TESTS MADE

Columbia Steel Co.



A General View of the Iron Rods Imbedded

A test highway has been built at Pittsburg, Calif., upon which a series of tests will be made to determine the good and bad features of 13 different types of concrete pavement. The types selected represent results obtained from a questionnaire which was sent to many highway engineers, asking for their views on road building, and also what features should be included in the tests.

The road is 18 ft. wide, approximately one quarter of a mile long, and is built in an oval form, much resembling a race track. Four tunnels have been dug under the roadbed, and special instruments will be used to make graphic records of the effects of the various kinds of traffic passing overhead. For these instruments, rods are imbedded in the concrete, and extend down into the tun-

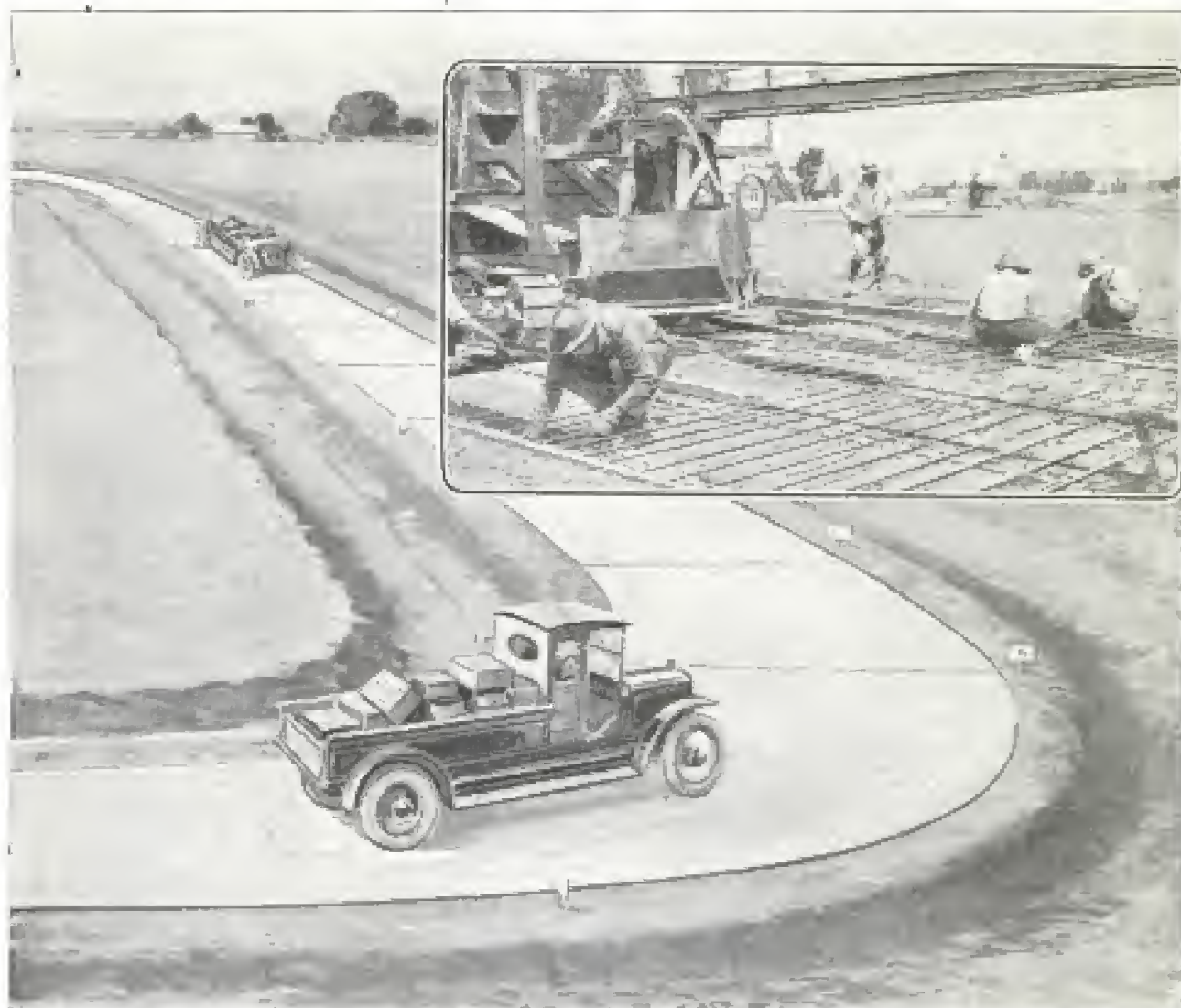
nels. At the end of the rods, recording pens are placed, so that the vibrations of the concrete road are marked upon a sheet of paper, which is unrolled by an electric motor. A special grade of reinforcing steel is being tried, and the road will be used for heavy traffic until it is completely destroyed, to prove which section is the best.

The surface of the pavement has been marked off in 6-ft. sections which are numbered and lettered. A close watch will be kept, and as soon as a crack appears in any section of the road, it will be recorded upon a chart. When the test is completed, the chart will show the location of each crack and the date of its appearance. It is thought that this is the first time any highway tests have been made from under the surface of the road.

The state of Illinois has also constructed an experimental highway about 12 miles southwest of Springfield, which is divided into seven different sections, or

WITH TUNNELS BENEATH ROADWAY

7457



Test Highway Showing the Various Kinds of Loads being Driven over It: The Cross Section Illustrates the in, and Placed under, the Road to Measure the Varying Pressure. At the Upper Right is Shown the Placing of the Reinforcing

types, of concrete and brick-paving material. The traffic tests of the road will be accomplished by means of a battery of 10 motor trucks driven by trained operators. The loading of the trucks will be increased after each 1,000 trips over the 2½-mile highway. The maximum wheel load will not exceed 12,000 lb., which is half again as much as the legal load in Illinois. There are no curves in the road, and the grades vary from zero to .4 per cent, with an average grade of .1 per cent.

ENERGY REQUIRED IN SEWING BY HAND AND WITH MACHINES

That there is a great difference in the expenditure of energy required with different ways of sewing, was demonstrated recently by scientists. Little variation was found in hand hemming on fine handkerchiefs, cotton sheets, 8-oz. cotton duck, or army blankets, but when the

speed of sewing was increased, the expenditure of energy increased in proportion. Hemming sheets on a foot-driven machine, which was discovered to be about six times as fast as doing the same work by hand, required six times as much energy, but the energy, per yard of sewing, was hardly one-half as great. When an electrically driven machine was used, the energy required per hour was not quite twice that used for hand sewing, and about one-fourth of that used for the foot-driven machine. The energy per yard of sewing was approximately one-fifth of that on the foot-driven machine, and less than one-tenth of that used in sewing by hand.

☛ Phosgene, the most deadly poison gas used in the World War, can be turned into a delicate-scented violet perfume, by means of a synthetic process which has recently been discovered by American chemists.

Science 11/4/21

Caffort Frères
125 bis, Rue du Chemin Vert,

88
7422 POPULAR MECHANICS
Paris, 11^e, France.

NEW EUROPEAN AUTOMOBILES PRESENT NOVEL FEATURES

Motor cars of a peculiar type, having their motors geared to the front instead

inches apart. This car is equipped with an ordinary steering wheel, and is supplied with various bodies for commercial and pleasure purposes. It is said to make a most economical light delivery truck.

A two-cylinder motor is mounted just back of the front fork. All moving parts are so inclosed that a hood is unnecessary. A spiral spring around the upper part of the steering pivot is used in front, while the rear springs are of the ordinary leaf type. A conspicuous feature of this car is that either the engine or gear box may be quickly and easily removed and replaced by extra parts.

Three-wheeled motor cars were used in Sweden in 1914, but because of a tendency to tip over in turning curves, their operation was restricted in many cities.

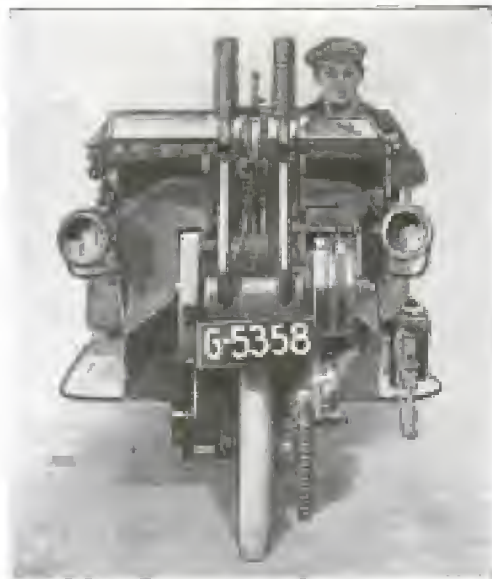
7625

It has been found that the disagreeable flavor that is imparted to eggs by cold storage, can be prevented by immersing them in a preserving fluid. This coats the eggshells so as to make them air-tight, and thus prevents the penetration of any particles of air which in the storage room becomes tainted.



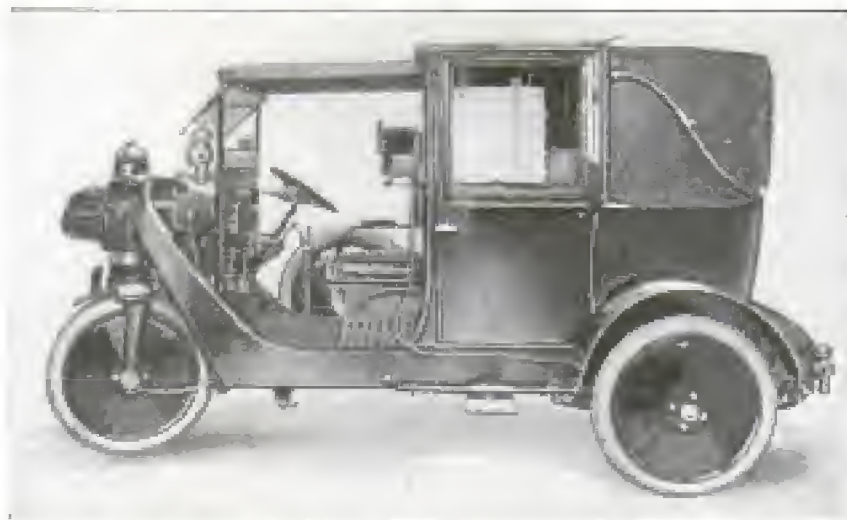
PHOTO COPYRIGHT, BETTMANN NEW CO.

Two Views of the Three-Wheeled Dutch Automobile Showing, Above, How the Front Wheel and Engine are Mounted, and the Long Steering Lever: From the Front, Below, This Machine Looks Much Like a Large Motorcycle



of the rear wheels, have recently made their appearance in Europe. One, of Dutch manufacture, and one French machine, are the most conspicuous examples. The Dutch car is a light three-wheeler with a single-cylinder vertical motor directly over the single front wheel. The frame of the chassis is formed into a V-shape in front and curved upward as a mounting for the motor and front wheel. Steering is accomplished by means of a long steering handle connected to the front wheel.

The French machine is said to be very economical in operation and is being used as a taxi, with rates as low as those of the horse cabs. Its frame is similar to that of the Dutch car and is attached to a fork at the front. From the side it appears to be a three-wheeled car also, but in reality has four wheels. The two front wheels are both mounted between the fork and only a few



The French Machine, Equipped as a Taxicab: It is a Four-Wheeled Car, Though from the Side It Appears to Have Only Three Wheels. The Two Front Wheels are Set Just a Few Inches Apart between the Front Fork

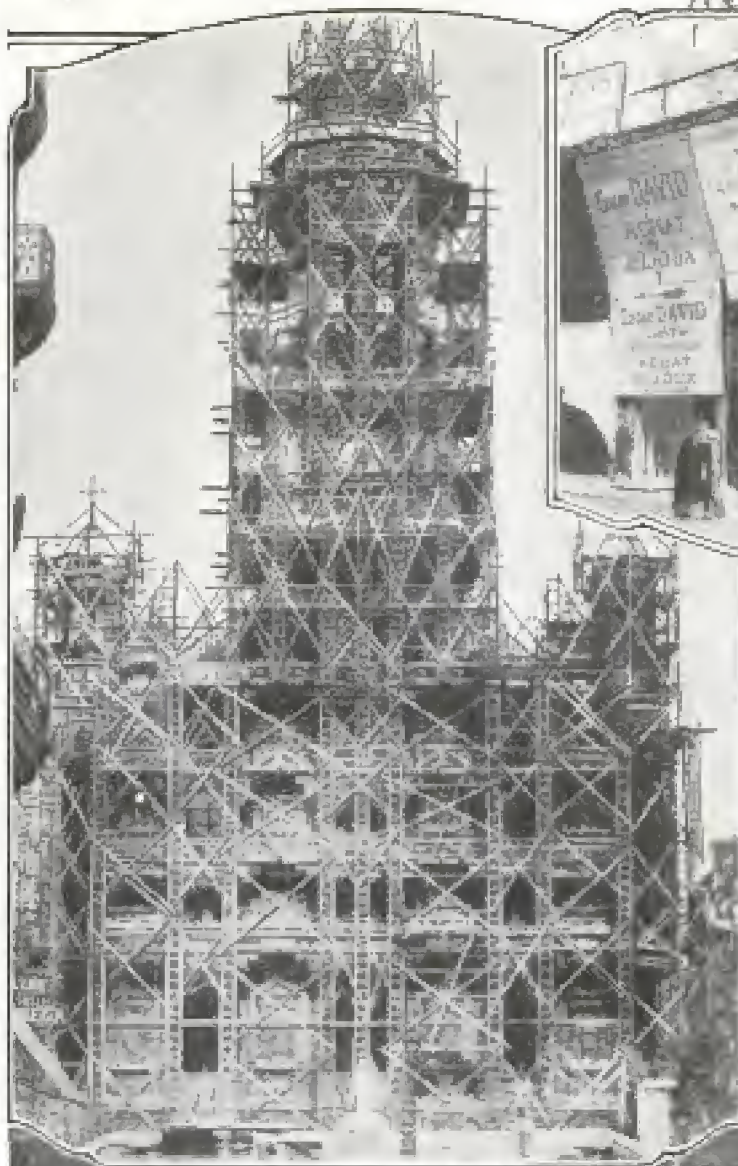
7415

Williams Service

32 Union Square

PARIS HUSTLING TO IMPROVE ITS APPEARANCE

New York City



"La Crise des Logements," as the Housing Shortage is called in France, is being met by Building Construction Which is Going On at a Furious Rate throughout All Sections of Paris. One of the Many Jewelry Stores of the Fashionable Rue de la Paix is Shown Above. Over It a Large Apartment Hotel is being Built. At the Left is the Unusual Scaffolding Put Up for the Purpose of Repairing the Historic Church of the Trinity, Which has been Seriously Threatened Because of the Deterioration of Its Stonework. An Empire Structure, Covered with an Intricate and Symmetrical Scaffolding Such as This, Presents a Novel Sight. This Church, in Renaissance Style, is among the Newer of Paris' Houses of Worship, being Built in the Period between 1860 and 1870.



Where Traffic is Congested, Red "Safety Bands" are being Laid in Paris Streets. Motorists are Required to Stop While Pedestrians are Crossing on the Bands. Workmen are Shown Here Laying a Red Band.

Cml. R. L. Chapman
894 Riverside Drive

Commerce Reports
10/31/21

90

POPULAR MECHANICS
New York City 7597

COLLECTION OF SEAWEED
AIDED BY TIDES

RAW-RUBBER SOLES NOW USED
ON ENGLISH SPORT SHOES

6717

Along the south shore of Long Island,
twigs anchored by means of short posts

English shoe manufacturers are prepar-
ing to make sport shoes with raw-rubber



The Barriers are Built to Trap Seaweed at the Ebb of the Tide. The Weed
is Then Raked into Stacks at the Farther End of Each Barrier

soles, since it was dis-
covered by tennis players
on Far Eastern rubber
plantations, that the
crêpe, or raw-rubber
soles, lasted longer than
those of the vulcanized
variety, and were much
more pliable. Rubber
soles are commonly seen
on different kinds of
footwear, but these have
undergone the vulcaniz-
ing process, which means
the introduction of a
certain portion of sul-
phur to make the rubber
less liable to be affected
by atmospheric changes.
It is thought that the
new soles can be made
to sell as cheap as the

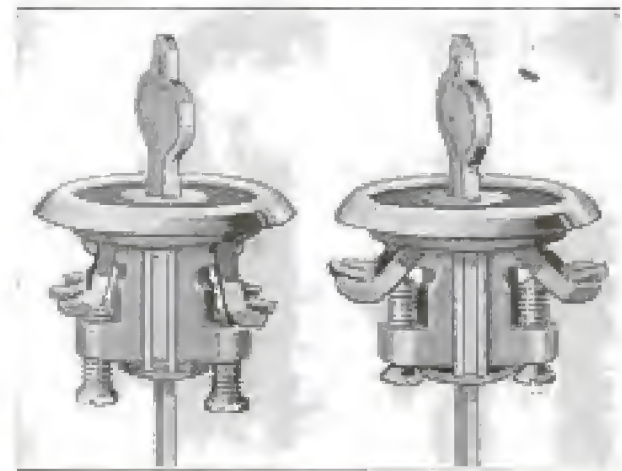
are used as barriers to trap seaweed be-
tween the flow and the ebb of the tide.
These barriers are placed at frequent in-
tervals, forming stalls into which the sea-
weed is washed at high tide. The ebbing
tide, receding, drops the mass of entan-
gled seaweed, which is then drawn out on
a stack beyond the reach of the water at
high tide. Large quantities of the weeds
are used as fertilizer, or burned to ashes
from which iodine and other chemicals
are made.

vulcanized article, even though they are
of pure rubber.

7524

CYLINDER FOR DOOR LOCKS
VERY EASY TO INSTALL

For door locks, an expansion cylinder
that fits and adjusts itself to any thickness
of door, can be installed more easily and
quickly than the old-style cylinder. The
cylinder has two hinged claws that move
outwardly and are gripped by two set-
screws, which are permanently engaged to
the cylinder. It is installed by inserting
it into the door hole and tightening the
setscrews with a screwdriver.



Cylinder for Door Locks That Fits and Adjusts Itself
to Any Thickness of Door. Left: Before Insertion.
Right: After Insertion with Setscrews Tightened

SURVEYING PARTIES NOW USE
AEROPLANES AND AIRSHIPS

To gain, in five weeks, more informa-
tion than the best-equipped land explora-
tion parties could get in a year, is the
goal of an Australian engineer who is
using an aeroplane in his work. His task
is to lay out a rough aerial survey of the
best routes for the proposed railway from
the north to the south of the continent.
Following his trip will come an airship
carrying a larger party of civil engineers,
who will verify the first rough survey and
make a more elaborate layout of the
topography of the land. It is expected
that a year's time can be saved by using
this preparatory aeroplane method, and
that eventually all extensive surveys will
be preceded by preliminary air-craft work,
thus also effecting a considerable saving
in money.

Segal Lock & Hardware Co.
155 Lenox St. New York

Aerial Age Weekly 11/7/21



Three Views of the Hollowed Out Sand Dune Which Is the Home of a California Hermit: The Exterior, Above, is Covered by a Desert Vine to Hold the Sand in Place. The Fireplace, at the Right, is Built of Shells and Coral. Below: Tables Holding Some of the Sea Specimens Which He Sells to Make His Living, and a Prospective Customer Examining Them



Living in a hollowed-out sand dune over which he has induced a desert vine to grow in order to keep his home from whirling away in a windstorm, a hermit residing near Santa Monica, Calif., ekes out an interesting existence in selling sea animals and plants to moving-picture producers. The stove within his humble dwelling is built of coral and sea shells which he has procured from the receding tides on the ocean beach. He has a stock of live inkfish, cuttlefish, and squids, as well as other sea monsters, which he keeps in glass tanks about the place. The motion-picture men have found it more profit-

able to buy their requirements of horse-shoe crabs, starfish, seaweed, etc., from the recluse than to search the seas for them. Remuneration for his wares nets the hermit enough for clothing and food, as well as a little money on the side for his other small wants.

¶ The Popular Mechanics Bureau of Information offers its free service to all readers of this magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished by addressing the Bureau.

WAGON LOADER WITH CREEPERS WORKS ON SOFT GROUND

No more need wagons or trucks be "stuck" in the soft ground surrounding



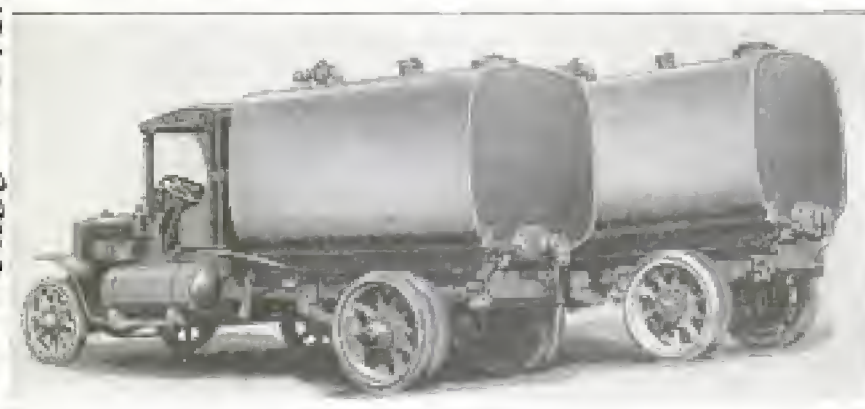
Here the Creepers are Seen, and Also the Propellers Which Push the Material into the Path of the Conveyor That Loads the Truck

the gravel or coal pile, with the use of a loader recently put on the market by a New York manufacturer. The loader, which is of the bucket-elevator type, has a distinct advantage over others in its line, because of being equipped with creepers, which provide a wide bearing surface. They are 10 in. wide and 8 ft. long, thus dividing the total weight of the machine so that the ground load is only 7 lb. per square inch. Propellers at the bottom of the conveyor force the material in toward the bucket elevator, which is driven by a 37-hp. tractor-type engine. This engine also drives the whole machine at a forward speed of 75 in. per minute, a reverse of 45 in. per minute, or a crowding, or loading speed, of 22 in. per minute, thus handling material very quickly.

POWDERED PEAT AS FUEL FOR HEATING FURNACES

Peat soils exist more or less in all parts of this country, but to the greatest extent in Minnesota. In this state there are approximately 7,000,000 acres of peat. It is therefore gratifying to learn that a stage has now been reached where plants are being erected for burning pulverized peat for heating purposes in large buildings.

heating plant in large air-tight containers carried on motor trucks. At the heating plant this powdered peat is dumped into a hopper at the road level, from which it runs to a second hopper, below, at the level of the furnaces. From this it passes through a screw conveyor into a fan blower, which drives it by means of suitable piping to the burners in the furnaces. The blower is under control so that the quantity of peat, and its force of delivery at the burners, can be regulated. In connection with the feed piping, a second system of piping is connected to a second blower for forcing additional air to the burners. The unburned peat, of which there always will be a certain amount, is blown back to the delivery hopper.



After It has been Pulverized, the Peat is Delivered to the Heating Plants in These Air-Tight Containers Mounted on the Motor Trucks. The Discharge Nipples Are at the Bottom of the Containers behind the Rear Wheels

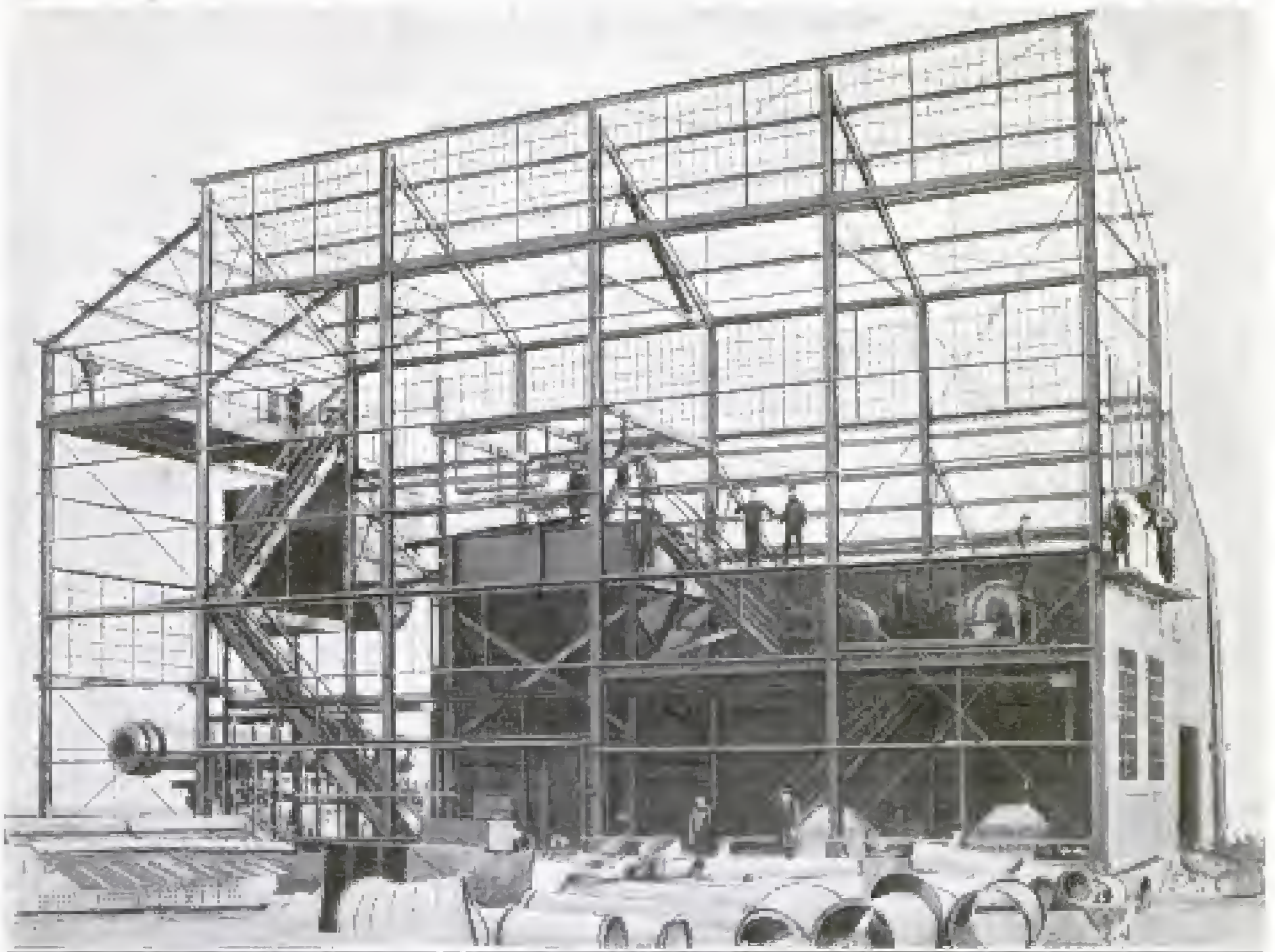
The first operation is to pulverize the peat, after it has been thoroughly dried, to the consistency of fine flour, in a special plant, from which it is delivered to the

this type was in a university registering about 500 students. Another plant, now in course of erection, will heat a large office building.

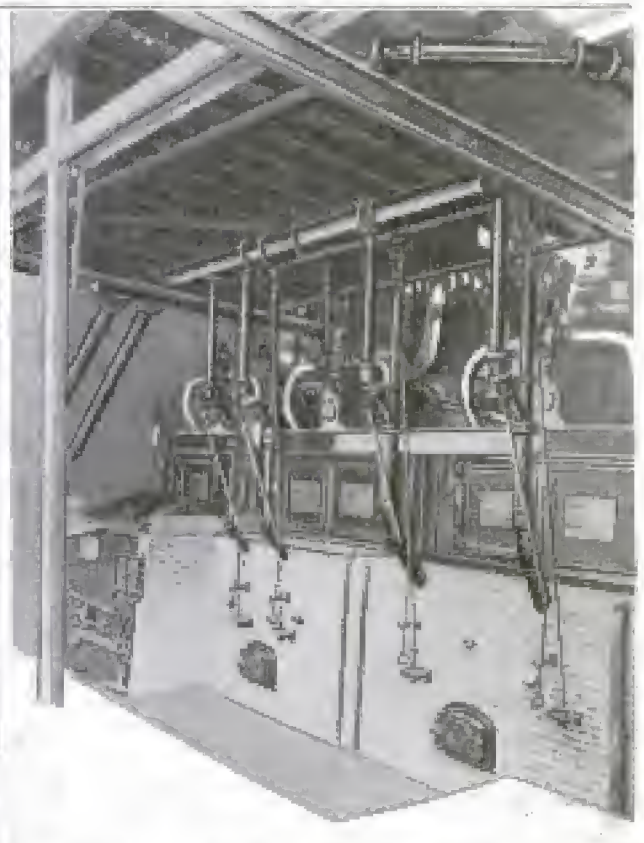
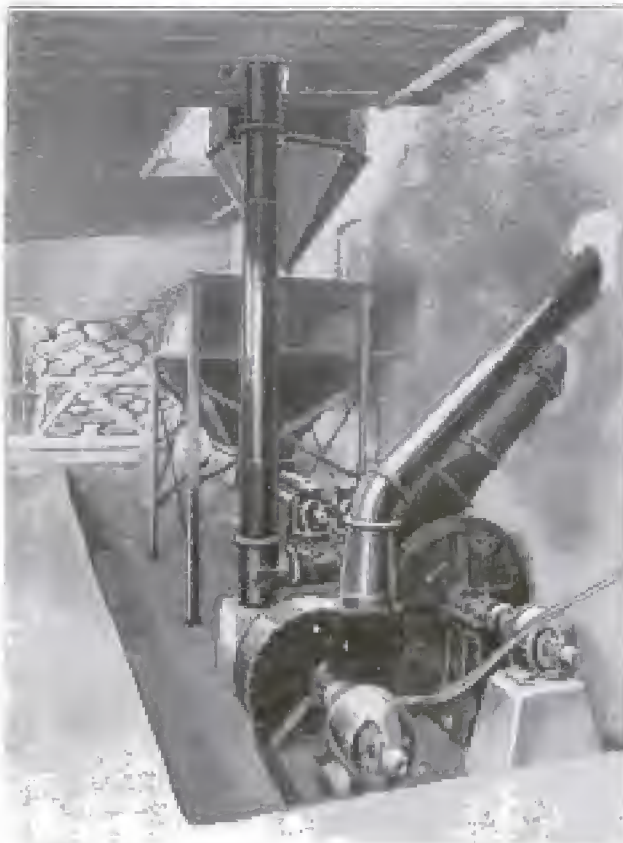
The first installation of

A. A. Halbeck

Cont. Arthur Hallam, Minneapolis, 317 Cedar Ave.



Peat-Drying and Pulverizing Plant in Course of Erection: In This Plant, When Completed, the Peat will be First Thoroughly Dried and Then Pulverized Until It is Reduced to the Consistency of Fine Flour. It Is Then Ready for Delivery to the Heating Plant in Any Building Suitably Equipped for Burning It



Left: In the Background Are Two Hoppers for Delivering Powdered Peat to a Blower, the Rear One of the Two Fans in the Foreground, Which Delivers the Peat to Burners in the Furnaces Shown at the Right. The Other Blower is for Forcing Additional Air to the Burners to Increase Combustion When Required

94 POPULAR MECHANICS
7562 912 Chicago Ave. Evanston, Ill.
DISHWASHING IS PLEASURE
WITH PORTABLE MACHINE

if a new portable dishwasher is used. The machine can be raised or lowered by a pedal, and is mounted on casters, so that it can be loaded at the table and then wheeled to the sink, where the water is run in. Five minutes of washing cleans the dishes, after which the dirty water is drained and hot water run in again, which rinses the dishes and cleans the washer at the same time. A small electric motor is used to circulate the water.

The most heavily timbered section of Alaska is the western slope of the Pacific coast and the numerous islands of the archipelagos that line this coast. In this section there are two National Forests, the Tongass, which embraces what was formerly known as the Alexander Archipelago, and the Chugach, which comprises the islands of the Prince William Sound. In both cases there is included a narrow strip, at most two miles wide, of the adjacent Pacific coast. The area of the government land in these reservations is 20,579,740 acres. It has

BOY SCOUTS STUDY GEOLOGY FROM NEW FIREPLACE

At the Evanston, Ill., headquarters of the Boy Scouts, a fireplace has been constructed for the study of geology and physiography. At the base are shown the different kinds of materials, in their relative positions, that make up the strata of the earth. At the top, many different specimens of ore are shown. Models of a lake bed, and of a river bed, are also built into the fireplace, which is ornamental as



well as useful, and it is asserted that the fireplace is the only one of its kind in the country.

Our Bureau of Information will answer all questions regarding articles appearing in this magazine.

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Reversible Scenery Arranged to Give an Indoor Effect on an Outdoor-Theater Stage: The Four Marble Settees and Massive Columns Produce a Portico Setting. By Stretching Canvas between These Columns, a Realistic Interior Scene of Any Kind can be Produced, Draperies, Rugs, Furniture, and Ornaments may be Added

REVERSIBLE SCENERY FOR OUTDOOR THEATER

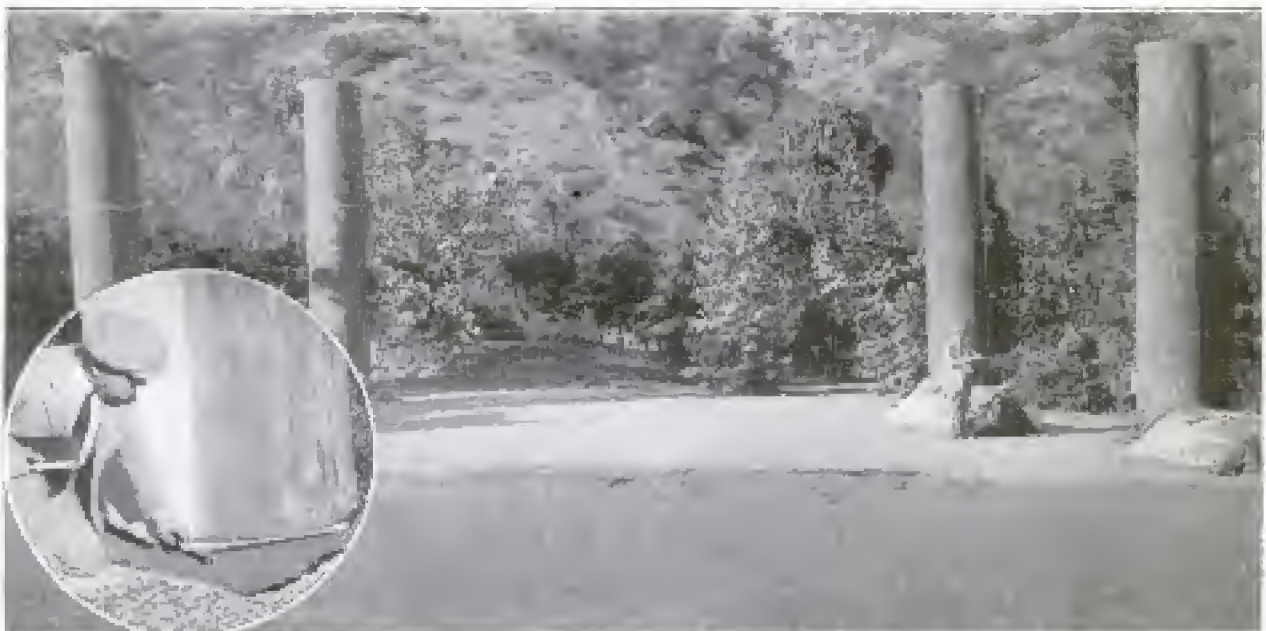
BY JOHN ANSON FORD

*416 Third League
Bldg. Los Angeles, Calif.*

THE problem of providing a change of stage scenery for an outdoor theater, which did not have so much as a curtain, not to mention other stage accessories, was solved recently by producers of two Shakespearean plays in the Hollywood Bowl, a beautiful and popular community-gathering place in a suburb of Los Angeles. The need of these two plays was for one outdoor and one indoor scene. This need was ingeniously met by building a set of stage furniture and properties, each unit of which was reversible. Thus, between acts while the lights were

turned off and the stage was in semi-darkness, each unit in this novel setting was turned around, or turned upside down, according to the character of the piece. The result was a complete change of scene. The idea, which the designers worked out themselves, never having seen it applied elsewhere, is applicable to other stages where the scenery facilities are limited.

The indoor aspect of the set consisted chiefly of four massive, smooth columns with square bases, and four imitation marble settees with high backs. These,



Outdoor Effects are Produced by Turning the Marble Settees Upside Down to Represent Moss-Covered Rocks, and by Giving the Columns a Half Turn to Make Them Represent Tree Trunks. Inset: Base of One of the Columns, Showing Its Support, and Casters under It to Facilitate Turning

together with other pieces of movable furniture, draperies, rugs, etc., were used very successfully in creating a portico



In the Foreground Is a Close-Up of One of the Reversible Marble-Settees. In the Background Is One That has been Turned Upside Down, and in That Position Represents a Moss and Leaf-Covered Rock

scene, and by stretching of canvas between the pillars, a palace interior could be represented.

When the play demanded an outdoor setting, it was not necessary to remove all these cumbersome articles. Instead, the pillars were turned around on their bases, each being mounted on casters, and forthwith the pillars were transformed into the trunks of huge trees. While this turning was done, branches were thrown about the bases, concealing the casters and adding to the general woodland effect. Likewise, the four settees were turned over, face forward, and became irregular, moss-covered rocks. To make the height of the settees appear less, each one was provided with a triangular addition that was placed next to the end, thus adding to the angularity of the rock. When the settees were set upright, these supplementary pieces were concealed immediately back of them, so that putting the pieces properly in place in the woodland scene was only a moment's task. Shrubbery and small trees growing at the back and sides of this outdoor stage helped materially in creating a very realistic scene, and while the tops of the trees were lacking above the massive trunks, the lighting was such at night that this was scarcely noticeable.

The construction of the settees was the easier of the two tasks, as it was only necessary to cover the back side with stage moss and canvas, properly painted to represent stone. In making the pillars, the work was less simple. Since the outdoor theater had only a natural

floor of earth and sod, it was necessary to set a wooden platform about 3 ft. square, in the earth for each of the pillars. This

base was made strong enough to carry some ballast within, and heavy iron casters were screwed to the bottom so that, when placed on the wooden platform, it could be turned on its axis easily. A removable rectangular base piece, or more correctly speaking, a piece which appeared to be rectangular but in reality had only three sides, was set about the base of each pillar when it was a part of the indoor scene. When the pillar was used as a tree trunk, this base piece

was removed, and boughs were scattered about it, as previously mentioned. It is expected that this scenery will prove useful in non-Shakespearean plays also.

7349 ASPHALT PAVEMENT DUG UP WITH WORK-CAR TOOL

Instead of the old way of cutting asphalt pavement, in which hammers and chisels were used, street-railway companies have put in use a great labor saver in the shape of a cutting tool which can be attached to a work car. The tool projects downward from a shoe that rides on the pavement about 18 in. from the rail. This shoe is supported by a framework which is attached to the car at three points, and which can be swung up under the car when not in use. The cutting tool depends upon the weight of the car



Work Car Fitted with Framework and Shoe through Which Pavement-Cutting Tool Projects

to force it into the pavement, and in cold weather it is necessary to weight the car before the tool will cut.

U. D. Chamberlin
Market St. Railway Co. San Francisco
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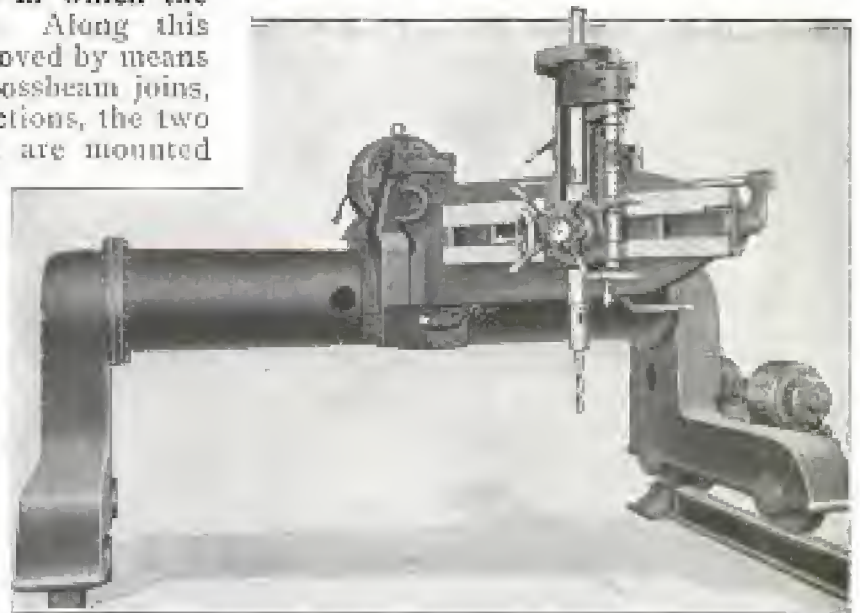
WRECK OF U. S. S. "MEMPHIS" LITTLE AFFECTED BY FIVE YEARS' STORMS.

THIS remarkable photograph, showing the wreck of the former U. S. S. "Memphis" being battered by the equinoctial gales of September, 1921, is striking evidence of the quality of American shipbuilding. During a hurricane in August, 1916, the armored cruiser "Memphis" was driven onto the rocks of the outer harbor of Santo Domingo City, in the West Indies. For five years the vessel has withstood the terrific hammering of the waves which is so clearly shown here. The spray can be seen going completely over the tail funnels.

7009 GANTRY DRILLING MACHINE— FOR DRILLING PLATES

In the manufacture of tank cars there is now being used a novel form of gantry drilling machine which is mounted on a track, the gauge of which is wide enough to straddle the tank plates in which the machine is drilling holes. Along this track the machine can be moved by means of an electric motor. A crossbeam joins, by means of flanged connections, the two parts of the machine that are mounted on the track, and from a pivotal support on this crossbeam swings a radial arm upon which is mounted the drilling head. The drill is driven by a motor mounted behind the radial arm on the crossbeam. With direct current, an adjustable-speed motor can be used, and with alternating current a multispeed motor, permitting a wide range of speeds through the combination of electrically controlled changes with the me-

chanical changes of the drill head. Two, three, or four radial arms and heads can be connected to the same crossbeam—in the case of four, two being on either side of it. The span of the drill and the gauge and length of the track can be adapted to suit any special requirements.



Gantry Type of Drilling Machine Which Travels on Track with Gauge Wider Than the Plates That It Drills by Means of a Drill Head Supported on a Swinging Radial Arm Connected to the Crossbeam to Suit Any Special Requirements

Crut. William H. Stamets, Pittsburgh, Pa.
Jenkins Arcade Bldg., Pittsburgh, Pa.

International Photo Service, 226 Williams St. New York City
Eng. News-Record. Bridge
 POPULAR MECHANICS
 7646 Nov 3, 1921
 100,000 VOLTS ARE CARRIED OVER BERLIN STREETS
 CONCRETE TRESTLES TO CROSS SOUTHERN RIVER SWAMPS



Lofty steel towers carrying high-tension lines of 100,000 volts are to be seen along the streets of Berlin, Germany. The city recently decided to operate a municipal lighting plant, and thereby supply the city with illumination free.

Not one of the three rivers of South Carolina, the Santee, the Pee Dee, and the Savannah, is crossed by a bridge within 170 miles of the ocean. They have, therefore, been more of an impediment than an assistance to development of the state. Plans have now been made for a bridge of similar design over each of these rivers. The largest one will be over the Santee River, at Murray's Ferry, about 65 miles from the ocean. This river, like the others, has a very narrow channel, the greater part of its width consisting of swamps, which, at the bridge site, are four miles wide at flood water. Over the main channel there will be steel-truss fixed spans and a draw span, but the main part of the bridge will consist of approach trestles, 6,000 ft. long, built of reinforced concrete. The spans will be of two types, the pedestal type with 36½-ft. concrete beams and bents on timber piles, the other having 24½-ft. concrete beams on concrete pile bents. Construction work is now under way. The bridge over the Savannah River will be located a little below Augusta, and a fourth bridge will cross the Wateree River at Garner's Ferry. All four bridges will cost about 2,200,000 dollars.

SHAFT-DIGGING MACHINE AND CAISSON SINKER

In the sinking of caissons for building foundations, as done at present by hand, men have to work continuously at the bottom of the shaft, with always an element of danger from cave-ins. There has now been developed a machine that digs the shaft and sinks the caisson more rapidly with one operator only, and with-



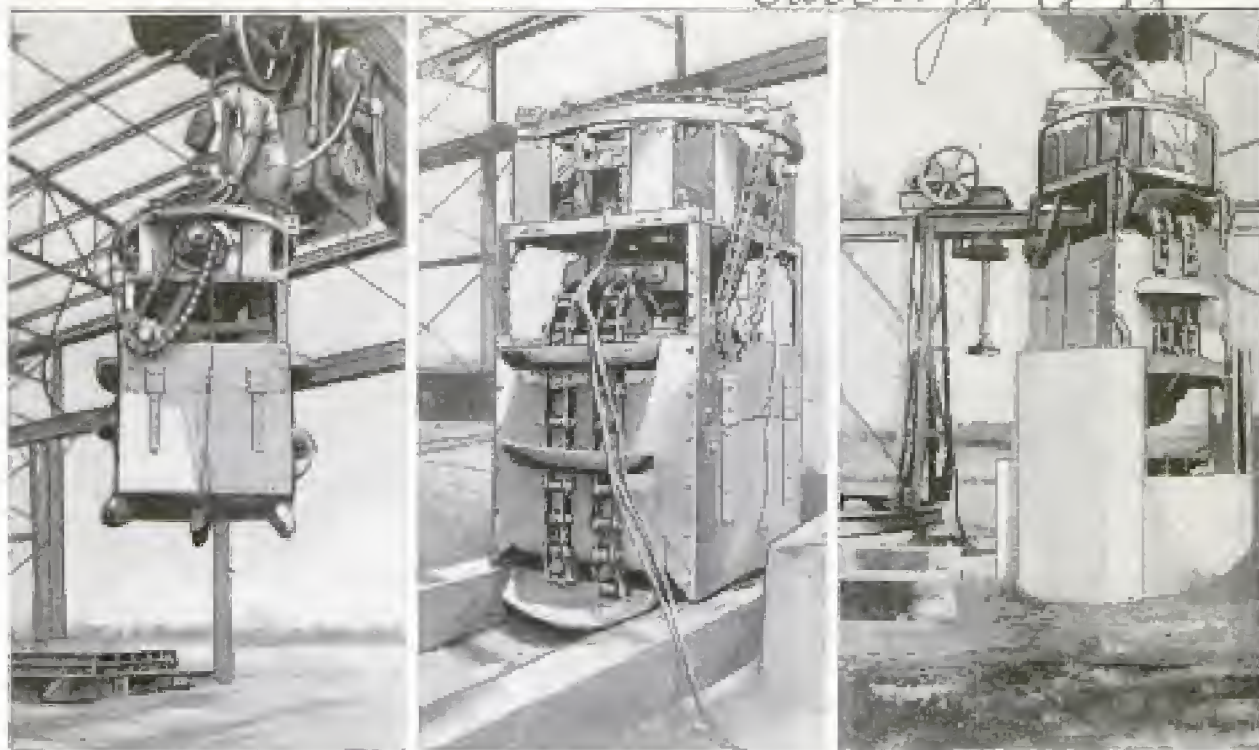
The "Interstate 3," a New Barge Which Is the Most Recent Addition to a Fleet Employed by a New Orleans Wholesale-Grocery Concern to Supply Its Branch Stores Located on Water Routes

7481

George W. Jackson + Fitzpatrick
Co. 104 W. Franklin St.
POPULAR MECHANICS

99

Chicago, Ill.



From Left to Right: Shaft-Digging Machine Shown Slung from a Crane with the Operator in Place; a Closer View of the Machine, Showing the Digging Buckets on the Endless Chain, and the Side Door for Emptying the Hoisting Bucket; Caisson Shown around the Digger with the Jack That Sinks It

out any possibility of a cave-in. Moreover, no pumping is required, which in hand-digging is always necessary.

The digger consists of a quadrangular hoisting bucket, around which runs an endless chain carrying a series of digging buckets. This is driven by an electric motor and speed-reduction outfit, which are mounted in a rigid framework above the hoisting bucket. The digger is slung from a derrick or crane, and after being filled, is hoisted and instantly emptied by raising a door on each side of the bucket. This and all other operations are under control of the bucket man, who rides on top of the machine. As the digging proceeds, the caisson is sunk into the shaft by a jack, operated above ground, that can be moved along a swinging cantilever beam to any point on top of the caisson.

rains or spring floods, the stream would no doubt occupy the highway also, regardless of the protests of delayed motorists.

520 MOUNTAIN STREAM AND ROAD SHARE TUNNEL

A tunnel that answers the double purpose of accommodating highway traffic, and forming a bed for a mountain stream, can be seen near Asheville, N. C. The tunnel was originally built by railroad engineers, to carry the stream away from the tracks, but the state highway commission laid a false concrete floor in it, thus dividing it into two parts. In dry weather, the water is easily carried in the small runway, but in the event of heavy



At the Top can be Seen the Railroad Right of Way; in the Center, the Automobile Demonstrates the Roadway, and at the Bottom, the Stream as It Is in Dry Weather

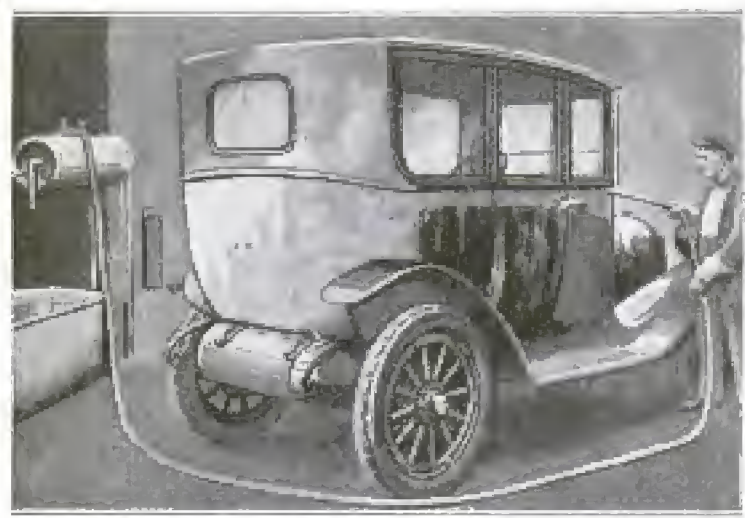
Cont. A. J. Groome, Box 807
Charlotte, N. C.

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7384 Universal Paint
 Removing Co. 422 W. Liberty St.
 Louisville, Ky. **POPULAR MECHANICS**
Auto *2nd Wayne, Ind.*
MACHINE REMOVES PAINT QUICKLY AND CHEAPLY
FORT WAYNE, INDIANA, FAMILIES BUILD THEIR OWN HOMES

7512
 1/10/13
 tel
 rec

Removing paint from automobile bodies is easily and quickly accomplished with a new machine. The device consists of a



The Machine in Use Removing Paint from the Body of an Automobile: Besides Being Economical, Its Use Makes an Easy Task of One That Is Hard When Ordinary Methods are Used

Fourteen families in Fort Wayne, Ind., with the aid of a real-estate company, have beaten the house shortage by building their own homes, doing the actual work themselves. They spent the whole summer on the job, some even camping on the ground so the whole family could work whenever possible, and they are now living in their houses. The company purchased materials, with marked instructions, from a concern selling ready-cut houses. Each prospective house owner agreed to do the labor of building in place of a first payment, and when the house was completed, to pay the cost at the rate of one per cent a month. The work was supervised by carpenters employed by the company. Many occupations were represented in the colony, which included a blacksmith, plumber,

electrician, painter, railroad shopman, machinist, conductor, carpenter, mason, printer, and a salesman.

end. As. W. Esregne
 445 W. Pearlman St. Madison, Wis.

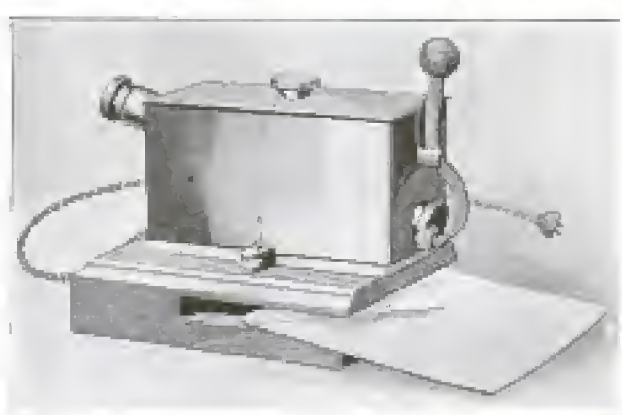
tank and heater, attached to the city water main. The water is heated to a temperature of about 200° and mixed with a chemical compound in the tank. By means of a hose attached to the tank, this mixture is thrown onto the surface of the machine and completely removes the old paint. About one hour is required to clean the entire body and chassis of an automobile. This cleaner can be adapted to use in railroad shops, to prepare coaches for repainting, and is said to be economical, not only of time but also of labor and materials. Hence it should be a welcome addition to shops doing such work.

7583 *Radio-Broadcasting*
WIRELESS CONCERT HEARD BY MOVIE AUDIENCE

A wireless concert was heard by the delighted patrons of a motion-picture theater at Cedar Rapids, Ia., recently through the courtesy of the University of Wisconsin wireless station, which makes a practice of sending out all important musical entertainments given at Madison. Before each entertainment, the surrounding stations are notified regarding the time of the concert, and the wave lengths that will be used in sending it. Thus, those who wish can "listen in," and in the case of theaters, large amplifiers, or loud-speaking receivers, are used to magnify the sounds so that the audience can hear plainly anywhere in the auditorium.

7542
ELECTRIC DEVICE FOR MELTING AND APPLYING SEALING WAX

An electric device for melting and applying sealing wax, exhibited in Paris, France, is a small box set on a slotted base. The wax is inserted through an opening at one end and melts when the current is switched on. When a spring lever, at the opposite end, is pressed, it



Copyrights, HAZEL & HENRI
 The Opening, with a Screw Cap, for Inserting Wax, Is at the Left End. The Slot Allows the Envelope to be Placed below the Other Opening

uncovers an opening from which the melted wax drops onto the flap of the envelope, inserted to the proper depth into the slot in the base.

153 E. 42nd St.
 Copyrighted material
 New York City

7420

El inventor. Robert Warren
 Minneapolis, Minn. no street address.
 POPULAR MECHANICS 101
 Cmt. Arthur Hallam, 317 Cedar St
 Minneapolis Minn.



The Safe-Desk is Shown at the Right as It Appears When Closed and Locked. At the Left It has been Unlocked, the Top Swung Back, and the Desk Partly Raised by the Lever Seen on the Front of the Safe. In the Center the Desk is Completely Raised and Opened to Show the Arrangement of the Compartments

COLLAPSIBLE DESK FITS IN SAFE

A compact, complete, and fireproof bookkeeping system is a most welcome addition to garage equipment. The desk folds up, and is lowered into the safe by a lever attached to the front. The lever is then removed and the top of the safe is swung into place. A secret cabinet is located in the bottom of the safe, where valuables may be deposited. The safe is as nearly burglar-proof as is possible, being of regular safe construction and made of steel 4 in. thick. The desk comes completely stocked with standard sales books for garages.

LUMINOUS STAR MAP AIDS AMATEUR ASTRONOMERS

The fascinating study of the stars is the oldest of the sciences, and one which has interested human beings for ages. The average person, who has not the time to take up this extensive study, but whom the stars interest as he gazes up at them on a clear night, is usually bewildered if he tries to distinguish one from the other. As an aid to the amateur astronomer, a star map has been drawn which shows the stars of the first five magnitudes, and the different constellation groupings. The stars of the first four magnitudes, and the lines showing the constellation groupings, are marked with radium salt, thus making them shine at night. The map is 4 ft. long, 1 ft. wide, is hinged for convenient folding, and is mounted on cloth or linen, which makes it easy to handle or carry.

Mr. E. W. Syndell
 Oak Park, Ill.

STATUE OF FAMOUS HORSE CAST IN BRONZE

It is not often that a horse is honored by a statue, but this tribute was paid to "Justin Morgan," the progenitor of the Morgan horses which have been famous in farm-animal history for the last century. A bronze statue of the animal was presented to the U. S. Department of Agriculture's Morgan horse farm, at Middlebury, Vt., by the Morgan Horse Club, on the centenary of its death. The figure, by a prominent animal sculptor, cost \$18,000 and stands on a granite pedestal on the lawn of the farm.



This Statue of "Justin Morgan," the First of the Famous Morgan-Breed Farm Horses, Represents the Standard of the Breed

Cmt. S. O. Winters
 702 Spruce St
 Bank Bldg Washington D C

74x8. La Belle Iron
Steel Co. N.H.,
102 POPULAR MECHANICS
Pittsburgh, Pa.
STEEL SMOKESTACKS WRECKED
BY 46-MILE WIND

N.Y. Times
4/7/21
P. 12

Eleven immense steel smokestacks, measuring from 4 to 8 ft. in diameter and from 80 to 135 ft. in height, were completely wrecked in a 46-mile-an-hour wind, during a recent storm in Pittsburgh, Pa. The stacks, which were part of a large steel plant, fell upon the roofs of the

buildings. Fortunately no one was injured. Damage estimated at over \$100,000 was done to the stacks and buildings.

7623
**NEW SUBMARINE POWER PLANT
WILL GIVE 10,000-MILE RADIUS**

Submarines of the newest design will have a cruising radius of 10,000 miles, owing to the installation of a new type

of power plant, thus enabling them to operate for a month away from their bases or tenders. The plant, which is a combination of gas and electric propulsion, will combine the latest developments resulting from experiments conducted by naval engineers. Twelve engines with a total of 6,500 hp. can drive these 300-ft. boats, of 2,025 tons, at a surface speed of 24½ miles an hour, and a submerged speed of 11½ miles. When completed in 1923, each of the three boats now being built at the Portsmouth, N. H., Navy Yard, will be armed with a 5-in. gun which is designed to remain exposed to the water when the ship is submerged. This gun can be trained almost in a complete circle or elevated as an anti-aircraft weapon. Machine guns will be mounted on the conning - tower bridge, and storage space is planned for 16 torpedoes of 21-in. size. Forward will be four torpedo tubes, and aft, two others.



Showing the Havoc Wrought to 11 Steel Smokestacks at Pittsburgh by a High Wind; In the Foreground are Seen the Prostrate Stacks, Some of Which Smashed against and Wrecked Near-By Buildings

Cmt. John H. Schaefer,
Sergeant Pittsburgh

7374
NEW IRRIGATION DAM OF MULTIPLE-ARCH TYPE

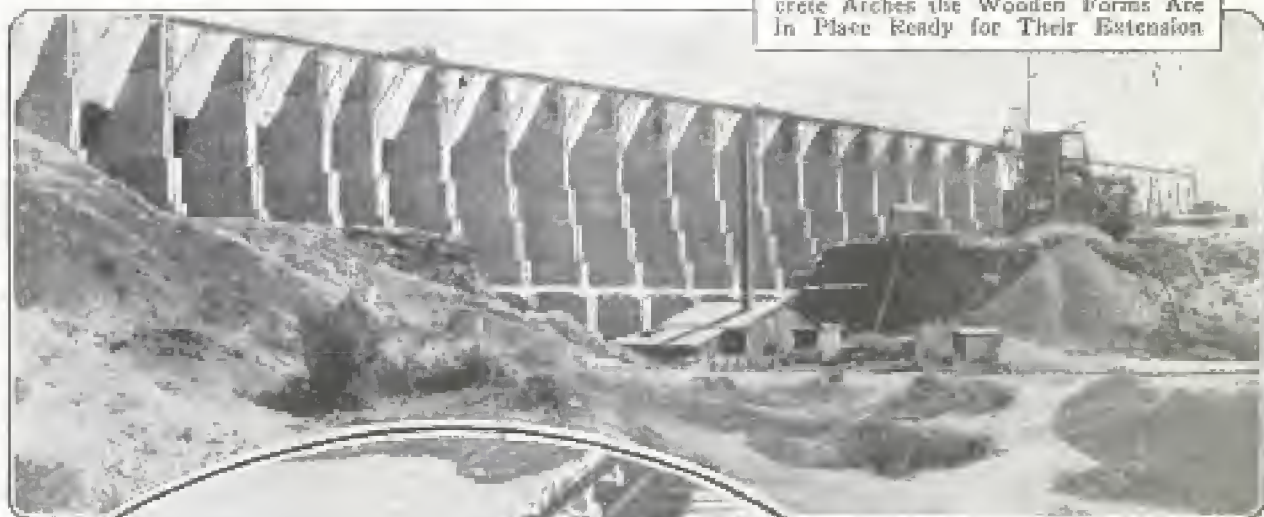
There is now under construction on Fish Creek, near Carey, Ida., a multiple-arch dam that will have a top length of 800 ft., when completed, and a height of 125 ft. The work has been stopped temporarily, but it is expected to be renewed this winter or early next spring. It will store water for the irrigation of several thousand acres of land. It consists of a series of reinforced-concrete

triangular-shaped piers, spaced about 25 ft. apart. The upstream faces of these piers slope at an angle of 50° from the horizontal, and their downstream faces are nearly vertical. Between these piers, along the entire length of the upstream face, is a series of arches, forming, in effect, much the same kind of structure as the reinforced-concrete floors that are common in large office buildings.

Cmt. James B. Hays
512 Franklin St Boise, Idaho



Upstream Side of Irrigation Dam under Construction, Showing the Arches Nearly Completed: At the Time the Photo was Taken, the Dam was Holding 45 Feet of Water. Above the Concrete Arches the Wooden Forms Are in Place Ready for Their Extension

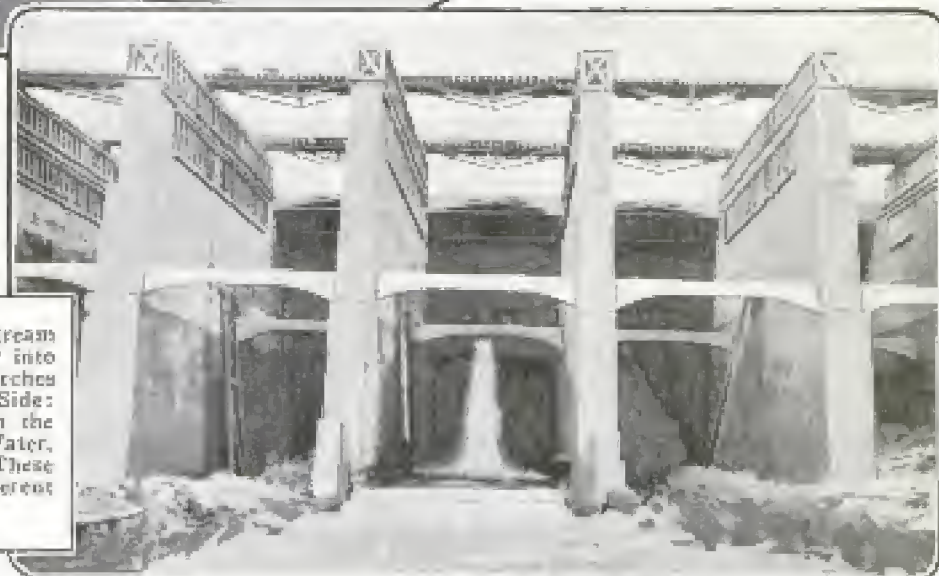


Above, the Downstream Face of the Dam Showing the Rear of the Piers with Their Slight Slope from the Vertical: Here Are the Concrete-Mixing and the Erecting Plants. In the Foreground Is the Power House, with Engine and Boiler Equipment. These Piers Are 25 Feet Apart and Are Over 100 Feet High. The View Shows the Greater Part of the Dam, but Not All of It



Close-Up Showing Very Distinctly the Construction of the Wooden Forms for Pouring the Concrete Arches. These are Removed after the Concrete is Poured

Looking from the Downstream Side of the Dam Directly into the Underside of the Arches That Form the Upstream Side: Here is Seen in Operation the Means of Passing the Water. There Are Several of These Discharge Valves at Different Elevations



SIGHTLESS UNION MEN RUN BROOM FACTORY

A small broom factory established some time ago in Washington, D. C., with the

backing of the American Federation of Labor, is perhaps the first of its kind to be operated exclusively by blind workmen. These are all disabled members of labor unions of recognized standing, as of course it was for the benefit and protection of its own unfortunates that the federation sponsored the enterprise. The equipment was bought, too, with money subscribed by locals of the city. Though the making of brooms is at present the only activity, it is hoped that in time the factory will be enlarged for the manufacture of belts, mops, baskets, and chairs. Were it not for this enterprise, many of these men would be hard put to make their living.

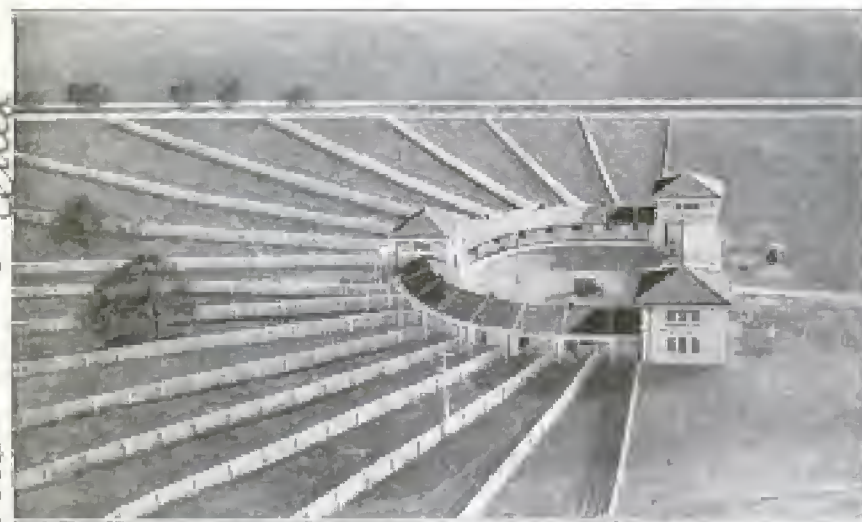


The Broom Factory, a Corner of Which Is Seen Here, was Established with the Backing of the American Federation of Labor for the Benefit of Blinded Union Men

552

HORSESHOE-SHAPED BARN BUILT ON MISSOURI FARM

On the Pickering farm, near the town of Belton, in western Missouri, there is a barn and corral which are laid out in a



This Horseshoe-Shaped Barn, with Radiating Runways Forming the Herd-Bull Corral of a Big Farm in Western Missouri, Presents a Curious Sight

curious way. The farm is stocked with 1,000 head of cattle, and the barn and corral were built to care for the herd bulls. The barn is in the shape of a horseshoe. Fences radiate from it and inclose several acres of ground, dividing it into 17 separate runways.

1600

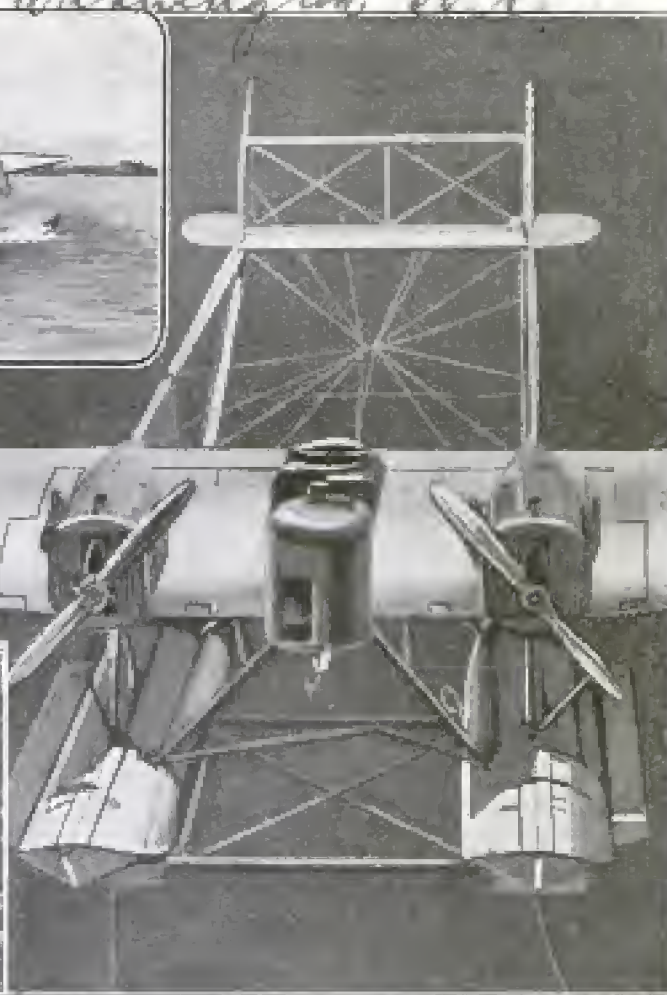
ENORMOUS DECREASE SHOWN IN 1921 COAL PRODUCTION

During the first six months of 1921, the world's coal production decreased enormously from the high mark attained in 1920. The total coal mined during that period is estimated by the United States Geological Survey at approximately 579,000,000 tons, or at the rate of about 1,158,000,000 tons a year. If maintained, this rate would produce, for the year 1921, 550,000,000 tons less than in 1920, and much less than in any of the preceding 10 years. The British miners' strike, lasting from April to June, and the industrial depression, affecting the manufacturing and shipping of the entire world, are considered chiefly responsible for this decrease.

Write our Bureau of Information if you wish to know who makes or sells any article described in this magazine. Send no postage; the service is free.



Above: The New Curtiss Mono-Seaplane on the Water during the Tests. Below: The Control Surfaces of the Tail Structure. At the Right: The Plane, Showing the Method of Mounting the Engine Nacelles and Cockpit, and the New-Type Pontoons.



MONO-SEAPLANE BEING TESTED AT ROCKAWAY AIR STATION

The new Curtiss mono-seaplane, except for the Loening plane which has recently demonstrated its success, represents the sole experiment with this type of machine in the United States. The Curtiss machine has been under test by the United States Navy, at the Rockaway, Long Island, air station, and the first photographs of it in flight have been obtained. The plane embodies principles of construction adapted from the J.L. and N.C. flying boats. It is equipped with two motor nacelles placed in the wing structure. Between these is the pilot's cockpit. When on the water the machine rests upon two pontoons of original design, placed directly below the engine nacelles.

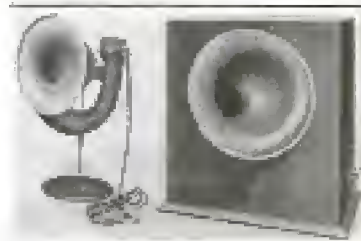
DENTAL CLINICS IN SCHOOLS ARE INCREASING IN NUMBER

Replies to a questionnaire recently sent out by the U. S. Bureau of Education show that in 286 cities dental clinics have been established in connection with their public-school systems. In 181 of these

cities the clinics are supported by the local boards of education; in 33 by the city health departments; in 22 by these bodies jointly, and in 50 by the Red Cross or private donations.

WIRELESS RECEIVER SHAPED LIKE HUMAN EAR

Using the human ear as a model, a remarkable wireless receiver has recently been designed. A small reproducer, similar to that of a phonograph, consisting of a permanent magnet, armature, and mica diaphragm, turns the electrical energy into sound. The sound chamber is made of a wood compound, and molded by hand in the shape of the human ear. The receiver is of the amplifying type; that is, the sound is made louder. It is claimed that a telegraph message can be received at a distance of 100 ft. with this instrument.



John, 8 Broadway, N.Y.C.

7456

106

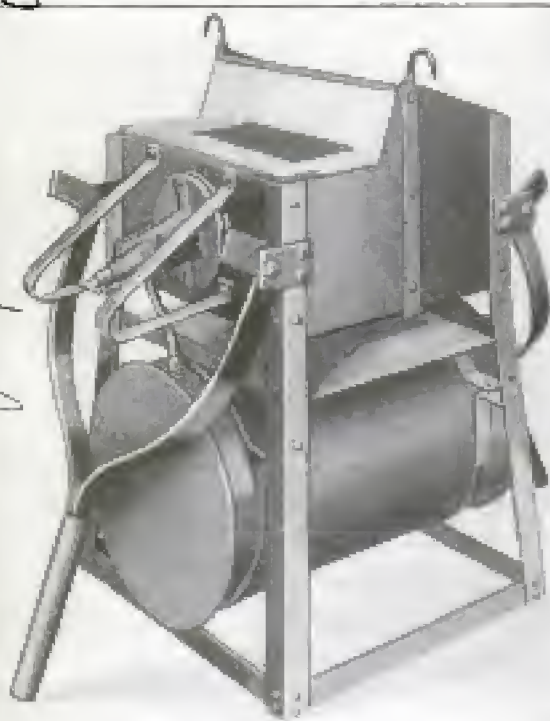
Horton Mfg. Co.
8 Tremont St.
Boston, Mass.

Times Eng. Sup.
Oct. 1921

POPULAR MECHANICS

**OIL-BURNING RIVET FORGE
FOR PORTABLE USE**

An oil-burning, portable rivet forge has been designed, that has folding handles, for carrying from job to job, and lifting



At the Top can be Seen the Rivet-Heating Chamber. The Carrying Handles Are on the Sides, and the Oil Tank is Seen at the Bottom

ears, for moving by crane. The burner is very simple to operate, as it uses low-grade fuel oils or kerosene, and will not clog nor sputter. Starting with a cold forge, it will produce rivets hot enough to drive within five minutes. No direct blast touches the rivets, which are handled from the top, and are always in plain view.

**DIE STOCK TAKES ROUND DIES
OF DIFFERENT DIAMETERS**

A die stock that will take round dies of any outside diameter from $\frac{5}{8}$ to $2\frac{1}{4}$ in., inclusive, is now on the market. The loose handle of the stock is readily adjusted to line up with the side spot hole



Above is Shown the Stock with the Two Thumb screws, and Also the 10 Round Dies Ranging in Size from $\frac{5}{8}$ Inch Up to $2\frac{1}{4}$ Inches

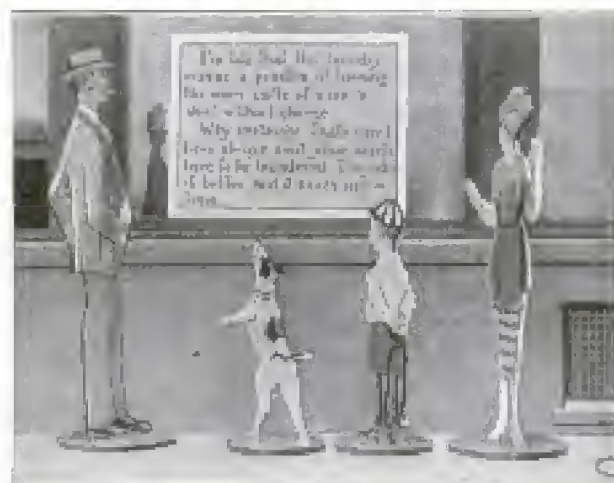
of the die by means of a sliding block which moves up or down in the jaw of the other handle, and is held in place by two thumb screws. The pointed end of the loose handle that fits the spot hole is of hardened tool steel and resists wear. Thus the same stock can be used for as many as 10 different-sized dies, which is certainly an advantage. The only possible disadvantage is that it is much longer and heavier than the standard stock when used with the smaller dies.

**RENEW PROPOSAL FOR CANAL
FROM NORTH SEA TO BALTIC**

Interest in the proposal to build a Danish ship canal from Esbjerg on the North Sea to Kolding on the Baltic has again been aroused by the reunion of North Schleswig with Denmark. The proposed route lies just north of the former international boundary. Because of the character of the country, the cost of a lock canal would not be prohibitive and it would form a valuable short cut between countries bordering on the two seas, besides opening new eastern markets for the North Sea fisheries.

**WOODEN FIGURES ATTRACT
ATTENTION TO WINDOW.**

A laundry in a western city has hit upon a most unusual way of attracting



This Novel Family Group Attracts People to the Window All Day, and is Easily Carried In at Night When Its Work is Finished

attention to signs displayed in its windows. Figures of a man, a woman, a boy, and a dog, cut from 1-in. boards, fixed on wooden disks, and brightly hand-painted, are placed in front of the window, during the day, as if looking in at the sign.

Hyman M. Frank
1708 W. 23rd St.
Los Angeles, Calif.

Chicago
Slaker-L. B. Burt
6233 Langley Ave. Chicago
Martini Machine Co.
Turners Falls, Mass.
307

Signs
Home-made by store.

4005

Loew's State Theater Bldg
Long Beach, Calif
 POPULAR MECHANICS
Illustration

107

OFFICE-THEATER BUILDING HAS THREE FIRST FLOORS



Third-Floor Street Entrance: The Steps Lead Down to the Lower Floors



The Sloping Street, Showing How There Are Street Entrances to Three Floors

The sharp slope of the business streets of Long Beach, Calif., to the amusement area at the water's edge is responsible for an architectural novelty in the form of a large theater located on the third floor of an office building, yet with its orchestra floor at street level. The building, of recent erection, occupies the entire end of the block. The first floor



Looking down the Street at the Side of the Building from the Upper Level to the Beach: The Large Entrance Is That of the Theater

fronts on a street at the amusement-area level, the third fronts on a street of the higher, business section. The second floor is directly accessible through an entrance on the third sloping street which intersects the first two. The owners of the new building receive practically first-floor rents for the first, the third, and part of the second story.

NEW TRUCK HANDLES AGGREGATES EFFICIENTLY

Loads of aggregate, such as sand, stone, slag, etc., generally used in the building of roads, foundations, and various other concrete constructions, are efficiently handled by a newly designed auto truck. Two end-dump hoppers, with a total load capacity of 5,000 to 6,000 lb., are located on the chassis, which has a very short wheelbase to facilitate turning. These hoppers dump their loads by gravity and are fitted with suitable springs to prevent damaging rebound, sideways, and similar abusive shocks, and the strains caused by the loading of only one hop-

per. Trips are provided whereby the operator may dump either load as desired.



The Two-Hopper Dump Truck: The Loaded Hopper, at the Left, Is in the Normal Carrying Position. At Its Front End can be Seen the Shock-Absorbing Spring. The Hopper at the Right has Just Been Dumped by Gravity

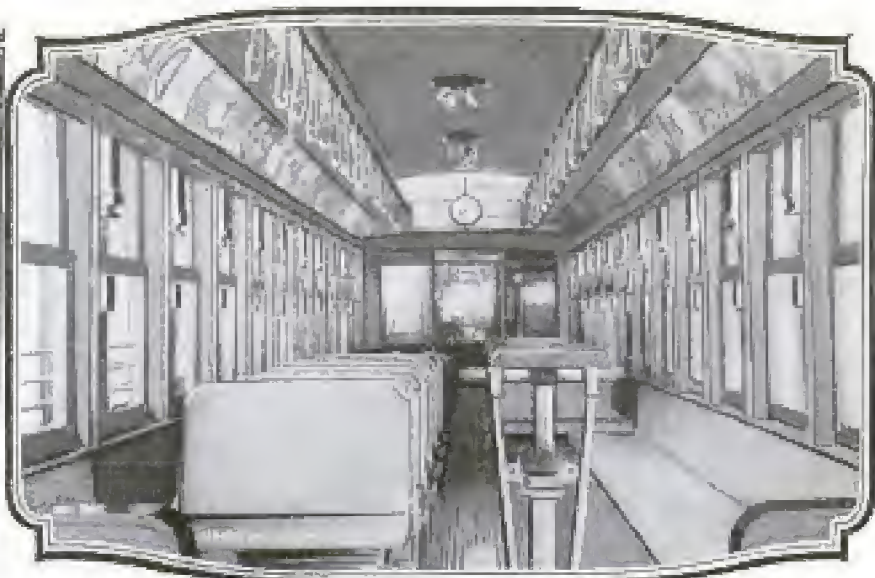
Encl. Allen R. Child
Per 73 Station E. Kansas City, Mo.

Encl. J. B. Horne. Shuman Design Club, Los Angeles & Long Beach, Calif.
Per 73 Station E. Kansas City, Mo.

CIVIC FEATURES THAT PROMOTE THE COMFORT



Reproduction of a Sign That Confronts the Automobile Drivers on All the Roads Leading into the Village of Richmond, Michigan: With Such a Courteous Warning, Any Driver Who Exceeds the Speed Limit Deserves to See the Village Jail, and to Continue Seeing It for a Longer Time Than might Be Altogether Agreeable



On Each of the Pillasters between the Windows of This Street Car Is a Nickel-in-the-Slot Machine. These Are Gum Venders, and They are So Designed That They Prevent the Depositing of a Coin When They Are Empty, or the Insertion of a Counterfeit When They are Loaded. All the Street Cars in Little Rock, Arkansas, are Thus Equipped. About Four per Cent of the Passengers Purchase Gum

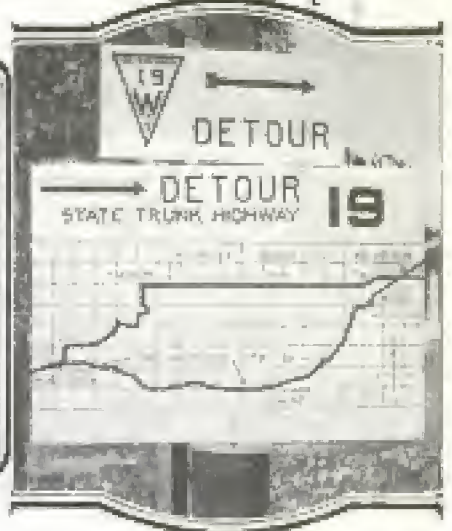


Municipal Band Stand in Library Park, Phoenix, Arizona: It Possesses, besides Its Architectural Beauty, Exceptional Acoustic Properties. By Actual Test It was Shown That a Match Dropped to the Floor from a Height of Five Feet could be Heard at a Distance of 150 Feet. A Speaker could be Heard at 250 Feet, and the Instrumental Music is Often Enjoyed by Citizens Seated on Their Porches Several Blocks Away. This Wonderful Transmission of Sound is Obtained by the Use of a Soundboard of Unusual Construction. It is in the Form of a Compound Curve with the Same Radii as the Curve of the Proscenium Arch, Which Has a Width of 35 Feet and a Height of 16 Feet

Architect - L. S. O'Leary, 1242 W. Madison, Phoenix, Ariz.

AND ENJOYMENT OF VISITORS AND RESIDENTS

R. J. Cornell, 6209 Lawton Ave. Electroch, Mich



One of the Little Cabins Located on the Tourists' Camping Grounds at Fergus Falls, Minnesota, Which Is on the National Park Highway. In the Little House Tourists are Furnished with Free Use of Water, Lights, and a Cookstove. At the Left Is Shown One of the Signs That Direct Tourists to the Camp

Each State Trunk Highway in Wisconsin Has an Individual Number. They are All Equipped with Exceptionally Informative Direction Signs. This One, at Madison, Drawn to Scale, Shows a Temporary Detour of 20 Miles That had to be Used While Part of the Highway Was under Construction



This Granite Clubhouse Is the Elks' Outpost at Camp Cajon on the National Old Trails Highway, and Is Located in the Mountains 20 Miles North of San Bernardino, California. It was Erected by the Elks of Southern California for the Use of Elk Motorists Who Pass That Way



Portland, Oregon, Known as the "Rose City," Is to Have a New Municipal Rose Garden. This Is a Picture of a Model in Relief of the Garden, on a Scale of One Inch to 20 Feet, That has been Made in Plaster of Paris and Painted in Oil Colors

5 Cent. Many Harrod Portland
483

BOWLDERS GIVE FORTH MUSIC WHEN POUNDED WITH HAMMER

The last to be expected from a rock is music. Yet, strange as it may seem,



There is Nothing in the Appearance of These Piles of Rock to Suggest Their Peculiar Characteristic of Producing Musical Tones

melody bursts forth from a pile of rocks near Marblehead, Mass., when they are pounded in proper order with a hammer. While surveying some newly acquired property preparatory to clearing it for

agricultural purposes, a farmer aimlessly tossed a rock at the neatly piled bowlders. He was surprised to find that they rang melodiously. Upon further investigation he found that each bowlder gave a different note. At once, he turned music student and learned to play tunes upon the rocks, which tourists may hear for a consideration. Many fanciful tales are current in the community as to the reason for the musical quality of the rocks, but thus far nothing in the nature of a satisfactory explanation has been given for this trick of nature.

PORTABLE CANVAS BATHHOUSE EASY TO CARRY AND ERECT

Portable canvas bathhouses are often an awkward and confusing combination of ropes, canvas, and long clumsy poles, but the latest type is simple. Four pointed, hinged poles are thrust into the ground at the corners of a 4-ft. square. They are hinged to top poles, which radi-

canvas is stretched. Folded, the bathhouse is only 42 in. long and 8 in. in diameter, and is easily carried on seashore picnics.

7533 — Equipment
EARTH TO MOON 100 TIMES WITH TELEPHONE WIRES

Although the telephone was put in use only a few years ago, the expansion of



Showing the Portable Bathhouse Erected on the Beach: The 16 Square Feet of Space inside is Sufficient for Dressing and Undressing. The Insert Shows the House Folded and Easily Carried by a Boy

this industry has been remarkable, and the following facts will illustrate it. Enough wire has been strung to reach from the earth to the moon 100 times, making a total length of more than 23,900,000 miles. The lines of poles erected would reach around the earth nearly 15 times, a distance of 375,000 miles, and enough underground duct space has been installed for carrying cables, to reach from pole to pole through the center of the earth, more than six times, or a total length of more than

ate to the corners from a block at the center of the roof. Over this frame the

45,000 miles. Over 33,000,000 conversations take place every day.

Chas. W. Mrs. Allen
Copyrighted material

clw J.C. Hammond
Jacksonville Fla

X-RAYS REVEAL ATOMIC STRUCTURE OF MATTER

BY ROGERS D. RUSK, M. A.

THOUGH atoms of matter are far too small to be made visible to the human eye, it is now possible to discover some of the chief characteristics of their nature and structure by means of X-rays. These characteristics show in a surprising manner how the atoms of all elementary substances are closely related to one another.

In the study of atoms an entirely new property of the X-ray is made use of. Every one of the 86 substances, known as elements, is affected in a different way by these rays. Each element reflects waves of a particular wave length, and these are called the characteristic X-rays for that element. Even in complex substances, the elements still reflect their own characteristic rays. Hence it is possible to analyze an unknown substance by measuring the characteristic X-rays it reflects.

When the characteristic X-rays of different elements are compared, it is seen that they are related in a striking manner. The heavier the atom is, the shorter are the waves reflected by it. This is true in an exact ratio for the atoms of all the elements, so that the elements may be arranged in a series numbered from one to 92, according to the length of characteristic waves they reflect. There being only 86 elements, six blank places are left in the series, which presumably represent unknown elements. It is thought, if there are no heavier elements to be found beyond uranium—which is number 92—that there must be only six elements remaining undiscovered.

The comparison between the characteristic X-rays of a substance and the characteristic colors given off by the same substance in a flame, or in an electric arc or spark, is striking. When table salt (sodium chloride) is thrown into a flame, the brilliant orange-yellow color characteristic of sodium is given off. The majority of substances give off a greater complexity of colors appearing as brightly colored lines in the spectroscope, which

Mc Connelsville Ohio
separates the different colors. The various spectra thus produced may contain from one or two to several thousand lines, some of which can only be detected by a photographic plate. The lines, each representing waves of a definite length, exist in complicated series, and any relationship between the elements is extremely

difficult to trace. On the other hand, the characteristic X-rays reflected by a substance are always few in number, simple in arrangement, and exhibit a definite and obvious relationship.

In Fig. 1 the chief lines in the visible spectrum are shown for gold, mercury, thallium, lead, and bismuth. The complexity and lack of

simple relation between these spectra are obvious. In Fig. 2 the X-ray spectra for the same elements are shown. The order and relationship are evident. The lines produced by these elements represent wave lengths belonging to what is called the L-series. All known elements give lines in the X-ray spectra falling in this series or in a similar series called the K-series, with the exception of those elements which give lines falling in both series. Not only is the relationship of the elements thus exhibited a qualitative one, but it is mathematically quite precise, and may be stated more scientifically

as follows: The square roots of the frequencies—or rates of vibration—of the characteristic rays are in the same ratio as the whole numbers from one to 92. The scientist who discovered the above relationship called these numbers the "atomic numbers" of the elements. When arranged by these numbers, it is found that all the

chemical and physical properties of the elements occur in a definite order, indicating the close relationship of the elements. The fact that this order is more perfect than that obtained by any other arrangement of the elements, shows it is based on something fundamental.

The reason these characteristic radi-

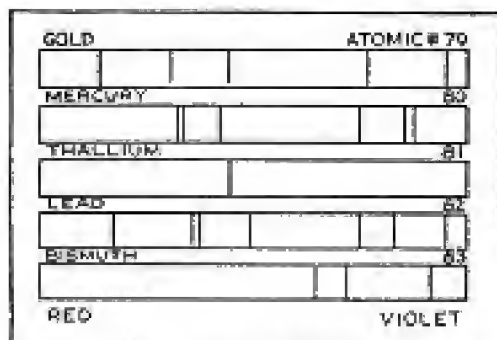


Fig. 1.—The Lines Produced by These Five Elements, When Observed in the Spectroscope, Are Complex and Unrelated

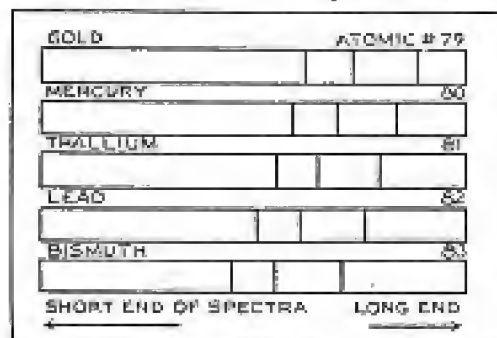


Fig. 2.—In the X-Ray Spectra of the Same Elements, the Lines Have a Distinct Relation and Fall in Regular Series

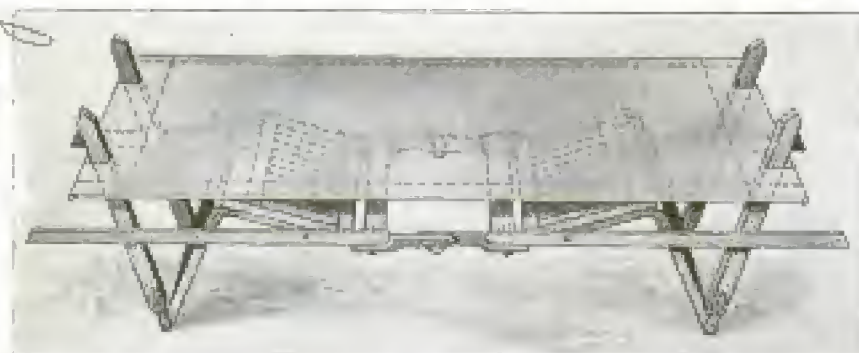
tions of the elements represent their properties so markedly is that X-ray waves are so small that instead of being reflected from the surface of the substance on which they fall, they are reflected by the individual atoms. Compared with X-ray waves, the atoms are large, and even the most highly polished surface is only a rough group of atoms. Each atom reflects a wave, but it can only reflect a wave length it is in tune with. Hence, because heavy objects will vibrate faster than light ones, the rate of vibration increases with the atomic weight of the elements, and the wave length decreases.

The relation existing between the elements is further proved by the many discoveries concerning the electrical nature of matter. It appears that the atoms of all the elements are composed of different numbers of electrical charges in different groupings. Several famous experiments even indicate that the atomic numbers are equal to half the number of free positive or negative charges in the respective atoms. And so it is that X-rays have helped us unlock the secrets of the atoms and aided us in our efforts to answer the eternal question:

What is matter?

USES TWO FOLDING CHAIRS TO MAKE PORTABLE COT

Light and portable cots have appeared on the market in several forms, but most of them are useful for no other purpose.



Portable Cot Made by Connecting Two Folding Chairs with Metal Braces and Hanging a Canvas Bed on the Upturned Front Legs

A Porto Rican inventor now has devised a method of using two ordinary folding chairs as the temporary frame of such a cot. The chairs are placed with their backs horizontal and turned toward each other, and rigidly connected by means of two hinged braces of $\frac{3}{4}$ by $\frac{1}{8}$ -in. metal. A canvas strip, 6 ft. 3 in. long and 12 in. wider than the chair seats, with wooden stretchers across its ends, is then hung on the upturned front legs of the chairs, which enter slots in the fabric. The bed so made is claimed to support 600 lb. or more. It is made in various lengths for children or grown-ups.

SPECIAL LIGHT FOR OPERATING ROOMS AND DENTAL OFFICES

An improved lighting outfit for the use of dentists and surgeons in the operating



Above: The Light Focused for Dental Work. Right: The Parts of the Lamp

room has recently been placed on the market. The source of light is a 100-watt stereopticon bulb, the rays from which are prevented from reaching the eyes of the operator or patient by means of front and side shields. They are directed backward toward 18 small, separate mirrors arranged in a circle, which converge the light and project it from 18 different angles onto the proper spot, thus producing an intensified light with a minimum of shadowing. The mirrors are made of blue glass to give a color value similar to daylight. The lamp is made of aluminum and is mounted on an adjustable arm.

United States gold coins, which were taken up three years ago, will be returned to circulation to test whether people prefer gold currency.



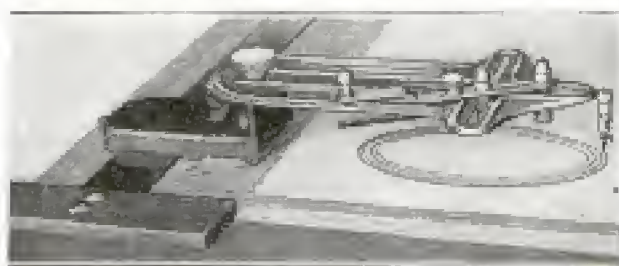
Scow That is Propelled by the Automobile near Its Stern: The Rear Wheels Have Cleats on Them like Tractor Wheels. These Cleats Engage Endless Chains That Pass over Octagonal-Shaped Pulleys on Either Side of the Paddle Wheel, and Thus Drive It

SCOWLIKE VESSEL IN ALASKA PROPELLED BY AUTOMOBILE

One automobile is frequently used to tow another, or any overland vehicle, and it is a practical idea to use an automobile for propelling a floating vessel. Such a craft is actually in operation in Alaska. The vessel is a flat-bottomed scow, decked to carry near its stern an automobile, over which is a framed housing. At the stern is a paddle wheel mounted on a shaft which is octagonal in cross section on either side of the wheel. These octagonal "drums" line up with the rear driving wheels of the automobile, which are preferably in the form of tractor wheels, having cleats that engage the links of a chain which is used for driving the paddle wheel. Astern of the latter is a rudder which is operated through a series of lines and guides by a steering wheel located near the front part of the automobile, so that it can be operated by the pilot in the driver's seat. The boat carries 30 to 35 tons of freight, and has been navigated for some time with entire satisfaction.

LABOR-SAVING INSTRUMENT FOR THE DRAFTSMAN

Every draftsman knows how much work there is in plotting or laying out an oval or ellipse. There is now on the market



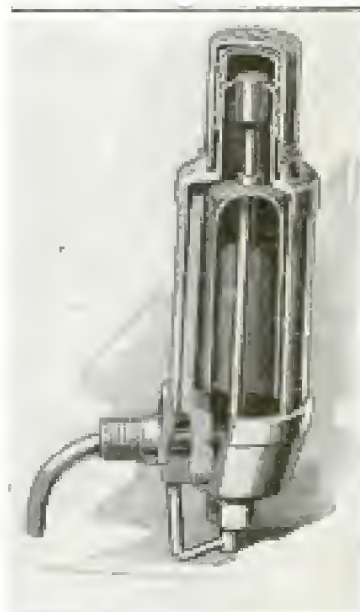
Instrument for Drawing with Pen or Pencil. Any Ellipse or Oval When Attached to a T-Square on a Drawing Board.

2 avol. Oehl & Co.
425 S. Wabash,
Chicago.

a new ellipsograph, neat and compact in appearance, that will draw any ellipse with pencil or pen on paper, in a most satisfactory manner, and which can also be used in photographic work with a scriber or knife to cut or strip a negative. On a drawing board, it is used in combination with the T-square, to which it is attached by means of a thumbscrew. It will draw an ellipse of any size and shape within its capacity.

VALVE FOR STEAM RADIATORS HUMIDIFIES THE AIR

An attachment, in place of the ordinary air valve, on a steam radiator maintains the relative amount of moisture in the air requisite for health and comfort in a steam-heated room. It possesses, besides, the advantage of eliminating all possibility of any hissing noise from escaping steam, or of leakage of water from condensed steam out of the valve onto the floor. A float automatically opens or closes the valve so that there is never an excess of steam, and just enough properly to humidify the air is allowed to escape from a perforated cap. A small tube leads from the interior through its connecting nipple downward into the radiator, into which all the condensed steam is drained.



Chicago Humidifier Co.
3214 Southport Ave.
Chicago

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES



A Notched Pole, Screwed to the Wall, is Used to Support Clothes Hangers for Infants' Wear. The Set is Enamelled and may be Had in Pink, Blue, or White



If a Bucket is Equipped with This New Spring-Compressed Roller Device, It Is Easy to Wring the Special Mop Supplied with It



To Hold a Kettle under the Faucet While Filling It, a Small Wire Device Is Convenient. It may be Fitted to Any Faucet by Tightening or Loosening the Wingnut



This One-Piece Aluminum Cake-Shell Pan Gives an Evenly Baked Shell for Fruit and Other Fillings



Two Galvanized-Iron Washtubs, Corrugated to Serve Also as Washboards, are Converted into a Kitchen Table by Means of a Removable Porcelain Top



An Overstuffed Davenport Has a Sliding Shelf with Casters, to be Pulled Out at Night. The Hinged Cushions, Folded Over onto the Shelf, Make a Comfortable Bed

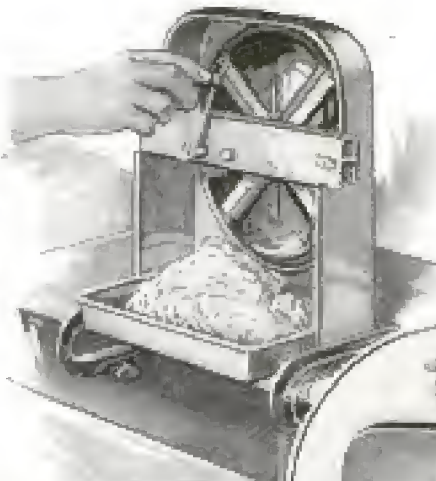


INTENDED FOR THE HOME AND ITS MEMBERS



Sanitary Drinking Fountain, Water Filter, and Bottle Washer are Combined in a Rubber-Tube Fitting on the Ordinary Faucet.

An Electric Cup That will Hold Any Bell-Shaped Glass, Heats Liquids Quickly, can be Set for Varying Degrees of Heat, and cannot Overheat



Vegetables are Sliced Quickly and in Uniform Thicknesses by This Machine, Which is Clamped or Screwed to the Kitchen Table. To the Right Is a Rear View of the Slicer



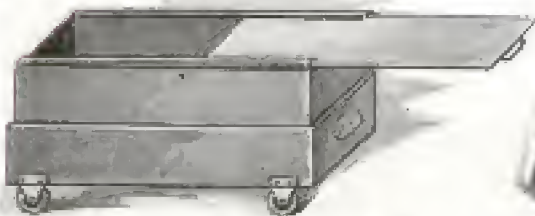
Above: An Inverted Bottle, in a Wire Holder, Keeps a Toothbrush Clean by Allowing It Air Space for Drying



Clamped to the Edge of a Table, This Folding Ironing Board will Not Wobble, and It can be Adjusted to Any Height



Left: Dusting is Made Easy by a Small Electric Vacuum Brush. The Dust Bag, in the Handle, is Cleaned by Removing the Cap and Turning on the Motor



The Ash Pan with the Screen Bottom is Placed in the Stove with the Slide under the Screen. When Full, It is Set into the Other Pan and the Slide Placed on Top Till the Ashes are Sifted



Folded, This Attractive Table can be Kept in a Closet, behind a Door, or in Any Out-of-the-Way Place. The Top is Made in One Piece, of White Porcelain Enamel



Esq. & Brewster
Turner, Peace & Co
 116
 24 **POPULAR MECHANICS**
 Seattle Wash
SAFETY CLAMP HOLDS LID
OF MILK CAN TIGHTLY

A new type of safety clamp, made from three pieces of spring steel riveted together, fits tightly over the lid and neck of a milk can, holding the lid firmly down. The invention was made by a Seattle



This Simple Device Insures a Tight-Fitting Lid When Used on a Milk Can. It is Shown in Detail at the Right milk-wagon driver, and cans have been dropped more than 10 ft. to demonstrate the efficiency of the gripping straps.

GUN MAKES GOLFING TEES OF ANY DESIRED HEIGHT

Golfing tees are now being made with a so-called "gun," instead of in the usual



way by hand. It is said to make the tees better and more quickly. It has a short barrel which is pressed into the sand box and filled. Inside the barrel is a plunger on a spindle with a knob on top, which is used to push the tee out,

and deposit it on the ground. The plunger can be adjusted in the barrel to make the tee of any height.

THE CENTENARY OF THE DEATH OF THE LIFEBOAT INVENTOR

September 28 was the centenary of the death of the inventor of the lifeboat, William Wouldhave, of South Shields, Eng. About 30 years previously he had, with his own hands, made his first model, which was the forerunner of the modern unsinkable lifeboat. Its unsinkability

Mr. Hartman + Braun,
A. S., Frankfurt-on
Maine, Germany

was caused by the use of air-tight compartments fore and aft. The same principle has been applied to boats which have saved countless lives, as notably instanced, in England, in one with a record of 1,028. Wouldhave was a house painter by trade, and was in no way connected with the sea. He died, as he had lived, a poor man. At his birthplace his original model is preserved as a memorial.

7365
INSTRUMENT GIVES HUMIDITY READINGS AT A DISTANCE

In cotton mills, refrigerating plants, storage rooms for tobacco, grain, paper, and other material affected by moisture, the exact degree of humidity existing in various parts of the plants, at any time has hitherto been ascertained by the well-known wet and dry-bulb thermometer method. A new instrument, in the nature of an electric hygrometer, is now on the market, which gives direct readings of the relative humidity at any distance from the room under control. A thermocouple, one end of which is kept wet by a muslin wick from a cup of distilled water, takes the place of the thermometer. These thermocouples may be distributed about the plant and are wired to the reading instrument, which registers directly the degree of humidity in the various rooms.

7308
SELF-CLEANING CARBIDE LAMP NOW AVAILABLE TO MINERS

A carbide lamp that practically cleans itself, is an improvement over the old-style lamp, which required the using of a



wire to clear the burner of clogging soot or carbon. On the improved lamp, the burner is cleaned by simply pressing a button. The self-cleaning lamp should be a timesaver, and should increase the efficiency of the miners, as well as avert accidents, because it does away with all danger of being caught in underground darkness.

cause it does away with all danger of being caught in underground darkness.

Wm. J. Johnson, of right material
Harwood

Similar design of padding
by A. S. & W. A. S. & W. A. S.
Chicago
Willems
W. W. London
England
Willems
W. W. London
England

Electricity Works

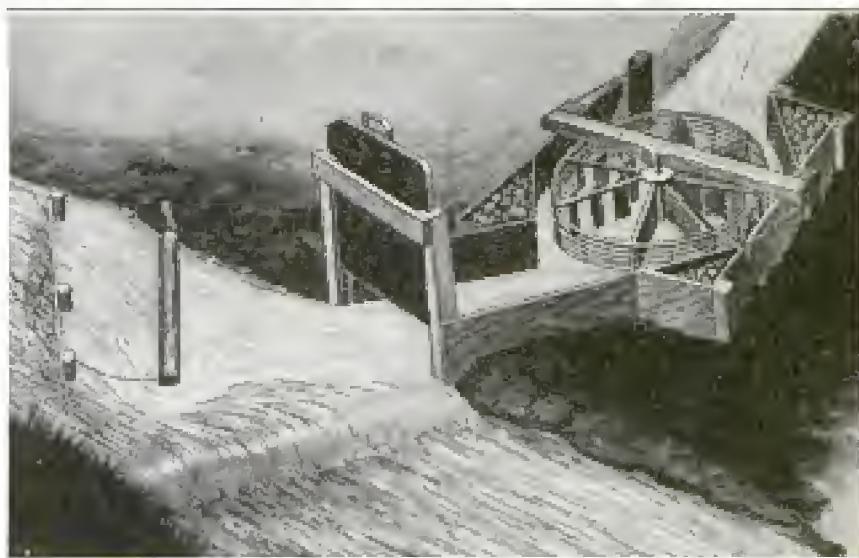
Wm. J. Johnson + Dwyer
35 Elm St. Harwood, Mich.

The Sphere
Oct. 8, 1921

SCREEN KEEPS FISH OUT OF IRRIGATION DITCHES

Various state laws require screens to prevent the destruction of fish through entering irrigation ditches. A new device seems to meet these requirements, and also excludes drift, without interfering with the flow of water. Fenders, on piling, part way across the main stream, deflect heavy drift past the intake, while below them a wooden float deflects any drift passing the fenders. Fish and small drift are excluded by a revolving screen set inside the intake. The water is directed to one side of a wheel, pivoted above and below, and having spokes of angle iron. Wings, of screening, attached to the spokes, are pressed against them by the flow which rotates the wheel. On the opposite side they

turn edgewise. The wheel frame is covered with screening. On each side, trash



Heavy Drift is Deflected past the Intake of an Irrigation Ditch by the Fenders, on Piling, in the Main Stream, While the Revolving Wheel inside the Intake Excludes Fish and Trash.

COMPANY CLEANS AND REPAIRS ITS MESSENGERS' UNIFORMS

One of the telegraph companies keeps its messenger boys looking neat and clean by maintaining, at San Francisco, Calif., a depot where the boys' uniforms are cleaned, pressed, and repaired about once every two weeks. This depot handles approximately 5,000 suits a year, including those worn by messengers in all the cities of northern California. Suits from other cities are sent in and returned by parcel post, in cartons holding six.

CONSTANT GRIP NOT REQUIRED BY SELF-LOCKING PLIER

One grip of the hand is all that is necessary to hold securely anything grasped by the jaws of an ingenious self-locking



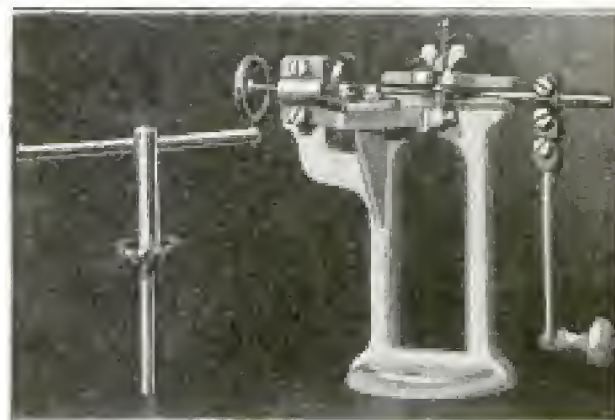
plier. There is no need to maintain any pressure on the handles, as in any ordinary plier. The self-lock-

ing device retains indefinitely the pressure of the first grip. To relieve this grip, the handles are opened in the usual way.

gates, with wire fingers, continually brush the surface of the wheel to keep it clear of any obstruction.

VALVE-REFACING LATHE SHOWS HIGH DEGREE OF EFFICIENCY

A simple though universally adjustable valve-refacing lathe has been developed, that shows a high degree of efficiency,



Refacing and Reseating Tools Shown with Valve Inserted and Ready for Refacing Process: The Reseating Tool is Shown at the Left

both in accuracy and speed. The lathe can be mounted upon any bench or held in a vise, and is adjustable to take any valve from $\frac{1}{4}$ to $\frac{1}{2}$ -in. stem diameter, and any valve head up to $2\frac{3}{4}$ in. in diameter. Thus it has a great range of work in the automobile field, and should be a very popular tool.

Ans. Charles W. Meyer
% Press Club, San Francisco, Calif.

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7501

7405

Leewards Marine

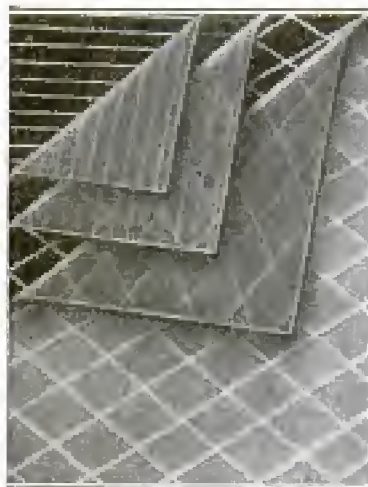
Leewards Marine
74 Nichols St.
Mfg. Co.

Ans. J. N. Jacobsen,
Manfield Cutter, Conn.

7194 Safipack Mills Mfr. Air Reduction Co
 118 727 Atlantic Ave. New York City
 POPULAR MECHANICS

WRAPPING PAPERS ARE WATER, DUST, AND VERMIN-PROOF

The recent ruling that automobile tires must be wrapped in waterproof paper for shipping, has been largely responsible for the development of new types of paper. One of these is a paper made in two layers cemented together with asphalt cement. It is also made with cotton cord laid in 1-in. diagonals, or $\frac{3}{8}$ -in. parallels, between the layers, making it practically untearable; or with wire substituted for the cord to increase its strength. For baling purposes, the two types of corded paper are joined with asphalt cement to form a nine-ply paper, consisting of four layers of paper, two layers of cord, and three layers of asphalt cement. It is entirely proof against water, dust, moths, rats, and odors, and is said to be superior to burlap as well as cheaper.



A Nine-Ply Sheet of Paper, Cord, and Asphalt Cement for Baling

Another type of paper has two layers joined with cement and crimped to three-fourths its natural length. Being capable of stretching one-third, without breaking, it is particularly suitable as a lining for bags, barrels, and bales.



This Type of Paper will Stretch to Shape for Lining Barrels

With the object of fire prevention on ships, the Board of Trade, in England, has issued a circular embodying its requirements as to the means of dealing with outbreaks of fire. Passenger ships, fitted

REGULATIONS SAFEGUARDING SHIPS AGAINST FIRES

With the object of fire prevention on ships, the Board of Trade, in England, has issued a circular embodying its requirements as to the means of dealing with outbreaks of fire. Passenger ships, fitted

for oil fuel, must have, besides the usual water service, protection in the lower part of the boiler room by means of pipes perforated for the emission of steam, controlled from outside of the boiler room. There must also be means of extinguishing fire with sand or other suitable material of that nature.

7390

RARE ELEMENT UTILIZED IN SPARK-PLUG TESTER

Neon, one of the rarest elements of the air, has the peculiar characteristic of



glowing bright red when an electric current passes through it. This has been utilized in a new spark-plug tester, consisting of a hard-rubber shell that contains

a small glass tube of neon. When the metal cap, sealing the tube, touches a spark plug, the action of the neon quickly shows whether the plug is working or not.

7340

REGULATOR TO CONTROL GASES IN OPERATION OF TORCHES

A new regulator for the control and delivery of acetylene, oxygen, hydrogen, and other high-pressure gases in connection with their use in torches, is now on the market. It maintains uniformly any predetermined pressure independently of any variation in the high-pressure source of supply, or in the consumption of the gases at the torch. The pressure is indicated on two finely graduated gauges, and is regulated by means of an adjusting key. The regulator is very simple, with few operating parts, and is exceptionally small in size and weight. Interchangeable gauges are provided that are adapted to the various gases and types of containers.



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The Air and Milburn Co. 1420 W. Baltimore material
 Baltimore, Md.

The Engineer, Oct. 7, 1921

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 New York City

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Camera Reports

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Handy Oiler Co.

491

POPULAR MECHANICS

Hlanville

Auto Access

PUBLIC TASTE WILL BE STUDIED IN TRAINING OF BUYERS

SIMPLE OIL DISPENSER QUICK AND ACCURATE

Acting upon the assumption that the wholesale buyer should come in more direct contact with the needs and desires of the buying public, the University of London has instituted a three-year course, upon the students of which will be conferred the "Degree of Commerce." Under modern commercial conditions, the buying public is separated from the manufacturer by numerous distributors, wholesale and retail. The wholesale buyer must accurately gauge the wants of the buying public.

The degree-of-commerce course has been created for the purpose of thoroughly training the student along the lines of his particular field of buying. The advantage of this course is apparent, and it should be an innovation of benefit to the manufacturer, wholesale buyer, retailer, and to the buying public.

EXPANDING RUDDER ACTS LIKE EMERGENCY BRAKE

An expanding rudder, for self-propelled boats, which when closed acts as an ordinary steering rudder, but upon being expanded stops the boat more quickly than by merely reversing the

An efficient oil-dispensing outfit consists of a glass container, very much like the ordinary milk bottle, fitted with a ta-

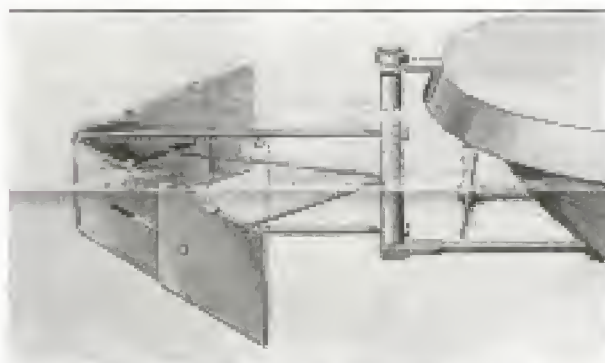


By Using an Outfit like This in an Auto-Service Station, Oil Tanks are Quickly and Easily Filled without Spilling

pered metal spout. A breather tube extends from the mouth of the tube inside to the bottom of the container. This equipment gives clean, quick, and accurate service, dispensing with the unsatisfactory measuring can and funnel method.

SHEET-METAL BOX PROTECTS EXTRA INNER TUBES

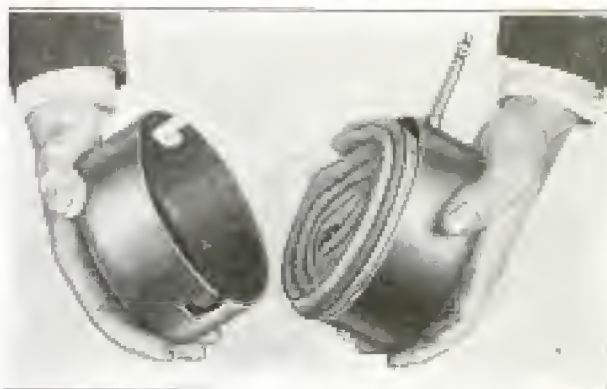
Extra inner tubes may be carried in the tool box, or anywhere on the automobile, and be protected from damage, dust, grease, and rotting, by placing them in a new inner-tube box. The tube is rolled up and placed in a drawn-steel shell, with the valve stem projecting. The cover, in the form of a bayonet joint, is held in place by the valve stem and a lug on the opposite side. The tube is slightly inflated to keep it from chafing.



Expanding Rudder That, When Opened Out in the Manner Shown, Stops a Motorboat Much More Rapidly Than by Merely Reversing the Propeller

propeller, is now being manufactured in Canada. It is particularly applicable to small motorboats, as it occupies no space inboard, and is operated by the steering wheel and a pedal near it. Connected to the rudderpost, like an ordinary rudder, is a frame, with a plate on either side of it hinged at its rear end in such a manner that each plate can be swung outwardly at an angle to the plane of the frame, and thus offer such resistance to their motion through the water that they stop the boat in much the same manner as an emergency brake stops a motor car.

A. L. Stewart
Sew. Steel
Toronto, Canada.



An Inner Tube in Place in the Box: The Cover is Slipped On, and a Twist Holds It Tightly

Martin Metal Mfg Co
Wichita, Kans.



Labor Day at Newport Beach, When a Thousand Wooden Blocks, Each with a Number on It, are Buried in the Sand: The Children are Lined Up, and at a Signal Scatter over the Beach, as Seen in the Picture, and Hunt for the Blocks. For Every Block There is a Prize in the Form of a Doll, or Some Kind of Toy, and the Finders Run to the Convention Hall, Where Each Receives the Prize Corresponding to the Number on the Block. A Year Ago, a Block Which had been Buried in 1918 was Found, and the Finder Received the Present Which had Remained All That Time Awaiting Its Lucky Claimant.



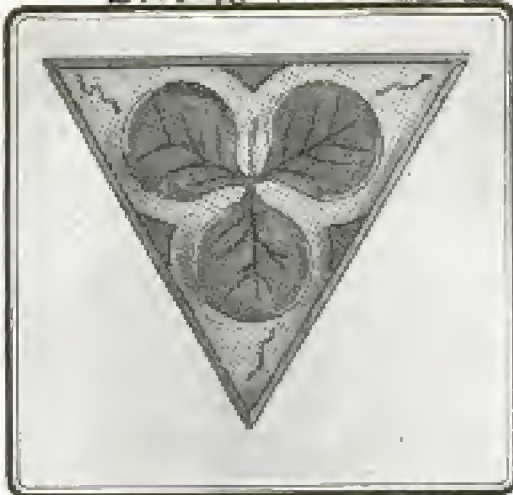
This Combination, When Opened Out as Seen to the Left, Is a Scooter for the Kiddies, and When Closed Up as Seen to the Right, Is a Walking Stick for the Grown-Ups. It is Thus Easily Transportable to a Park or Other Place Where a Child may Wish to Play with It. It is Made of Aluminum and Weighs Only Four Pounds. The Handle Is in Two Parts Which Fold Downward to Form a Seat That can be Used in Scooting.

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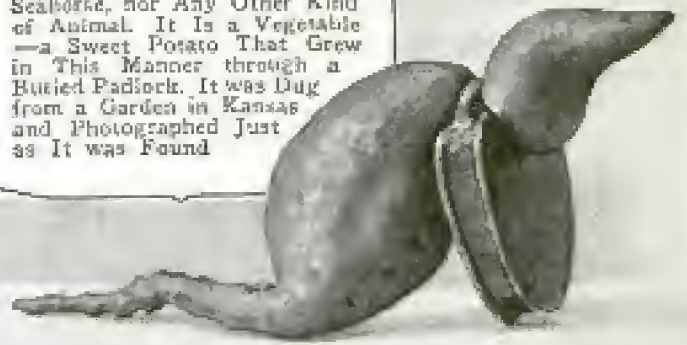
OF MODERN ACTIVITIES AND INTERESTS

data lost



A Game of Skill and, Therefore, Interesting: The Idea is to Move the Triangular Frame by Hand in Such a Manner That the Three Little Wire Snakes on the Bottom are Made to Wiggle from the Partly Enclosed Shamrock to the Three Points, as They are Shown in the Picture. A Wire Screen on Top Protects the Toy from Damage

This Is Not a Walrus, nor a Sealhorse, nor Any Other Kind of Animal. It Is a Vegetable —a Sweet Potato That Grew in This Manner through a Buried Padlock. It was Dug from a Garden in Kansas and Photographed Just as It was Found



A Dog That Barks but does Not Bite: When the Rubber Bulb Held by the Fingers is Squeezed, the Dog's Head Snaps Its Jaws and Barks Merrily, Just like a Dog Greeting Its Master or Mistress. It Resembles the Bark of a Dog So Exactly That Everyone Who Hears It for the First Time is Surprised to See Only a Toy



Here is Seen the Champion All-Around Athlete of Australia, Known as "Snowy Baker," Engaged in the Extremely Dangerous Performance of Throwing a Kangaroo. He Seems to be Enjoying Himself Immensely, Although Anyone Who Knows the Enormous Muscular Strength of the Tail, or the Hind Legs, of a Kangaroo would Not Regard This Undertaking as an Amusing Pastime. The Scene of This Little Demonstration is a Private Zoo, at Los Angeles, California

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Embee Novelty Co. (The Museum)
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Co., 3802 Ellis
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d. w. John S. Bidmore *Canl.*
Esneleph, Ont. Canada
POPULAR MECHANICS

122
 7/188

DOUBLE SEAT IS INVENTED FOR GOLF OR GARDEN

A combination of two seats, which can be used on golf courses or elsewhere outdoors, has been invented by a Canadian.

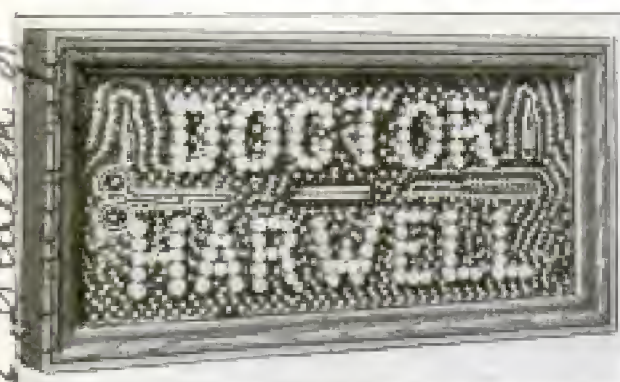


This Seat Provides a Shelter for the Golfer from the Rays of the Hot Sun or from a Sudden Shower

An awning covers the whole, and hooks are placed upon the framework to support pails of sand, water, or other golfing necessities, which should not be exposed to the rain or sun. The awning also shades the resting golfer.

PILLS AND CORKS USED ON SIGN OF DOCTOR

A highly suggestive, ornamental, and useful sign hangs in front of the home



This Unusual Sign of Pills and Corks Is an Entirely Homemade Article, and is Thought to Be the Only One of Its Kind in Existence

of a doctor in Poplar Bluff, Mo. It is composed of pills, corks, and surgical instruments, and is the work of the physician himself. So far as known, this is the only sign of its kind in existence.

CARD TEACHES SAFETY FIRST TO COUNTRY-ROAD PEDESTRIANS

In order to encourage safety first among people walking on country roads, Harry Park, of Portland, Ore., had a number of cards printed which he carries with him whenever he is touring. "Pedestrians should Walk on the Left-Hand Side of the Road, Thus Facing Approaching Machines—Safety Always," is printed on the cards in large black type. When he passes a person walking on the right side of the road, with his back to him, he sounds his horn to attract attention and throws out a card. Even if that person fails to pick the card up, some one will, and it will do its work in the campaign for reasonable caution. The idea does not apply, of course, to city traffic.

LAWN-SPRINKLING NOZZLE HAS FAN-SHAPED SPRAY

A lawn sprinkler for use as a hose nozzle, that has recently been introduced in the West, has some novel features.

Like other such devices, it is screwed onto a hose, and laid on the ground, resting on the ends of two supporting arms. The



outlet of the spraying nozzle has a slotted opening so shaped that it spreads the water into a semicircular fan-shaped spray, no water falling on the hose side of the nozzle. Thus the lawn can be sprinkled from the edge of a sidewalk without any danger of sprinkling passers-by, and for the same reason the nozzle is approachable from this side when it is desired to move it.

ELECTRICALLY WOUND CLOCK FOR AIRPLANES

An electrically wound clock for use in airplanes and balloons has recently been developed, and tested by the Bureau of Standards. It consists primarily of a watch movement with an electrical winding attachment operated from a three-cell, six-volt storage battery. The tests included its ability to stand severe vibration and temperature changes within a range from 120° above to 15° below zero Fahrenheit.

Bureau of Standards
Sept. 15, 1921

U. S. Patent League
7/5/21
Tishenr News Reports Service
Box 16, Station 9

Canadian
Min for the Craft
1910 Co. by the South Canadian
Canl.



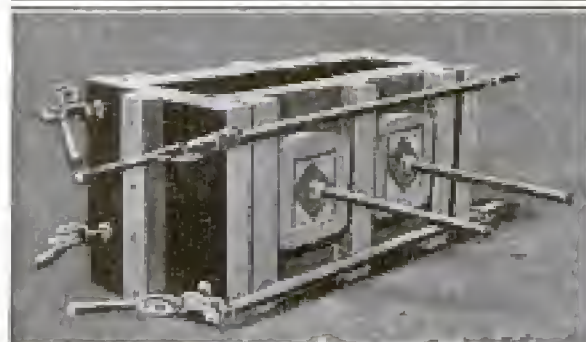
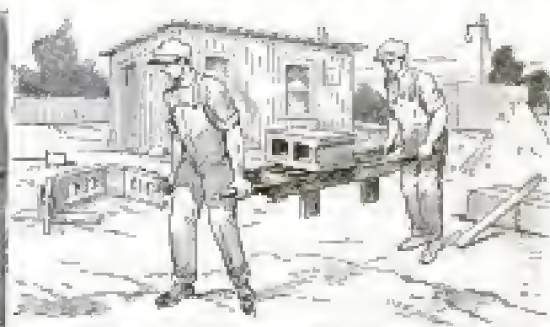
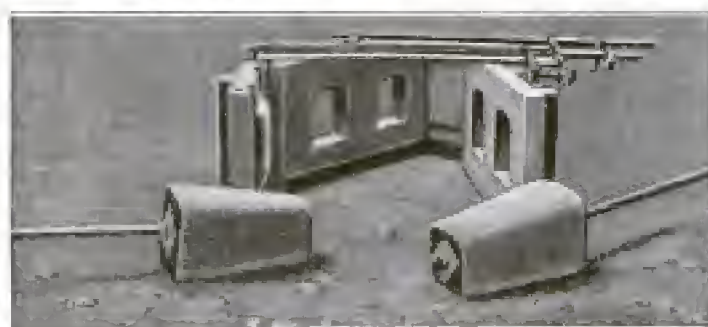
Mold for Making Concrete Blocks

By A. J. R. CURTIS

THE mold illustrated can be made from wood by any mechanic and used to produce concrete building blocks for quite a good-sized building. The bottom, ends, and sidepieces are made from thoroughly kiln-dried white pine, 2 in. thick, strengthened with 2-in. square cleats. The cores are merely tapered sections of 6 or 8-in. square posts. The wearing edges of the sides and ends are protected with strap iron, screws being used to attach both the cleats and strap-iron reinforcing. Handles of $\frac{1}{2}$ -in. rod

painted inside and out with any kind of light oil that will fill up the pores of the wood and keep out water. If the inside faces have been properly planed and sanded, the oil-surfaces will produce correspondingly smooth surfaces on the blocks. Only enough free oil should be left on the forms to prevent the concrete from sticking, the surplus being removed with a piece of waste.

The blocks may be cast either face down or face up, as preferred, and it is recommended that only plain-face blocks



The Upper Photograph Shows the Concrete-Block Mold, Opened, with Its Cores and Clamps; Below, Left, the Clamps Applied and the Cores in Position to Cast a Concrete Block. The Face of the Block can Be at Either the Top or Bottom of the Mold. Right, One of the Blocks Cast in the Homemade Mold, Showing the Hollows at the Center. These Openings Make the Block Lighter and Improve Its Insulating Qualities

or pipe through the cores are provided, so that they can be removed from the mold after the block has been cast. Carpenters' or cabinetmakers' quick-acting clamps provide the best means for holding the parts together rigidly, although simple strap-iron hooks and wooden wedges can be used if clamps are not available.

Before using the mold, it should be

be made, as they are simpler and better-looking than the rock-face block. If the face of the block is to be down, a facing mixture is first placed in the mold to a depth of $\frac{3}{4}$ in., and the remaining space in the mold box is filled with ordinary concrete, mixed as wet as possible, yet so that it will stand up without sagging when the mold is removed. If the facing is to be placed on the upper side, the mold

is filled to within $\frac{3}{4}$ in. of the top, and struck off with a template, after which the facing mixture is placed. Of course, all the concrete must be tamped thoroughly, and this is best done with a small foundry rammer, or one so constructed that the mixture is thoroughly compacted around the cores and in the corners.

The plain-concrete backing may be made of a mixture of 1 part cement to 3 or 4 parts of clean gravel, varying in size from minute particles to $\frac{3}{4}$ -in. pieces. The facing should consist of a mixture of 1 part cement to 2 or 3 parts of white sand, marble dust, or granite, the proportion and color of the ingredients determining the color and texture of the finished article. Cement-stucco mixtures, in a variety of colors and textures, may be

obtained from building-material dealers. After the block has been thoroughly compacted in the mold and the top struck or floated off, a straight, true pallet, made from 2-in. plank and cleated on the back, is clamped to the top of the mold, which is then turned over until the block rests on the pallet. The cores are then withdrawn, the mold carefully removed, and the block set away in a warm, moist place to season. The blocks should be carefully protected against sun, draft, and frost, preferably being stored where the temperature can be kept as high as possible and where the blocks can be sprinkled frequently, commencing as soon as this can be done without injury to the block. It is almost fatal to let blocks become dry during the first two weeks.

Engine Grates Made from Old Tires

While doing some threshing, the ashes were allowed to accumulate underneath the grates of the steam tractor, the result being a ruined set of grates. Not wanting to wait for several days until new grates could be received from the supply house, several old wagon tires were obtained, and, after cutting, were straightened out without heat. The iron bars thus obtained were cut into lengths to fit the grate racks, longer strips being provided at the sides for holding the grate in place. Three holes were drilled through



each piece. The separate bars were spaced by old nuts and washers, the whole being held securely together by round rods, threaded on the ends, inserted through the holes, and drawn up tight with nuts.

Tinning Small Work

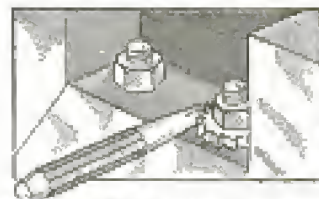
The work to be tinned is placed in warm water, to which a little sulphuric acid has been added, to clean the pieces of grease and dirt. Some powdered sal ammoniac is then added to the water and vigorously stirred until entirely dissolved. The work is then removed, washed in clean water, and placed near the fire to dry. A shallow pan, such as a frying

pan, is obtained, and the bottom perforated. This pan should be small enough to allow it to be dipped into the pot of melted tin. The work is placed in the bottom of this perforated container, and a little sal ammoniac is sprinkled over the surface of the melted metal; then, after all smoke from the metal has disappeared, dip the pan containing the articles into the tin, lift it out, and shake well to get rid of the excess metal, at the same time sprinkling a little sal ammoniac over the work, to prevent too thick a coating. The articles are cooled quickly by dumping them into water, which also produces a bright finish.

A Convenient Ratchet Wrench

The original ratchet wrench of the type shown was made by using the ratchet from an old chain drill, and an elaboration of the idea resulted in a complete set of such wrenches to fit standard-size nuts.

By making the wrenches from carbon steel and casehardening, it is possible to screw or unscrew nuts and bolts that are so located as to be inaccessible to wrenches of the usual kind. The nuts are screwed down by means of a drift and hammer, as shown; to unscrew the nut the wrench is turned over so that the teeth point in the opposite direction, the hammer and drift again being used.



Removing Stains from Concrete

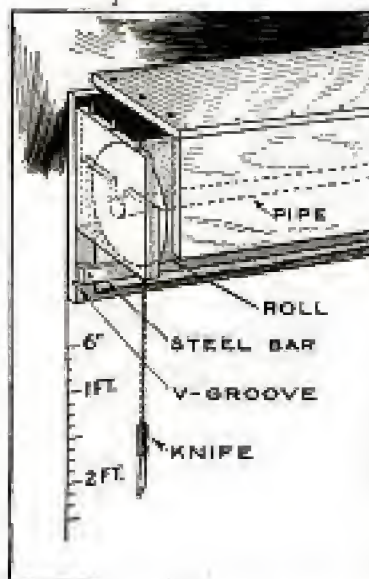
Stains on concrete and stucco are mostly caused by dirt and dust washed down from the windows. These can readily be removed by scrubbing with a heavy bristle or wire brush and water.

Occasionally stains are caused by iron dissolved in rain water. These are really rust stains, and come from iron piping, nails, etc. Often they resist scrubbing with plain water. In this case, a dilute solution of hydrochloric acid (muriatic acid) used with a plain bristle brush, is effective. After scrubbing, rinse well with clean water. Protect the hands with gloves when applying the acid.

A Reel for Drawing Paper

For most drafting rooms, detail paper is bought in large rolls that are heavy and awkward to handle when merely stood on end in a corner, as is quite often the case. By this system much paper is wasted through careless handling, and it was for the purpose of reducing this waste and placing the roll in a convenient position, that the reel in the drawing was devised. It was built as shown, the frame being screwed to the wall, and pieces of 1-in. material were attached inside each end as a support for the pipe roller. The top and front of the reel were made in a unit and held in place by dowels, so as to be readily removable. The paper, as it leaves the roll, runs underneath a $\frac{1}{4}$ by $1\frac{1}{4}$ -in. iron bar that serves as a guide when cutting paper from the roll, assuring a smooth, square cut, which is also greatly facilitated by the V-groove in the backboard of the reel.

The device is mounted about 6 ft. above the floor, and a scale in feet and inches is painted on the wall, making it possible to draw out a sheet of the exact size required and cut it off quickly and smoothly, with square corners.—J. H. Kay, Cleveland, Ohio.



Limousine Sled for Winter Touring

The limousine sled shown in the drawing is the product of a locality where winter comes early and stays late, and

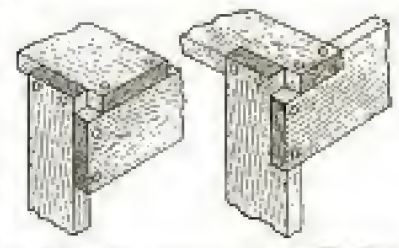


A Limousine Sled, for Use in Localities Where Arctic Winters Are the Rule and Passable Roads the Exception at This Season of the Year

where roads, that are none too good normally, are even worse at this season. The runners of the sled are made of heavy plank, suitably crossbraced and shod with tire iron. The comfortable body is built to convenient dimensions and provided with windows on all sides, and a door. In this particular vehicle, a comfortably upholstered seat from an old automobile gives a touch of luxury.—John Hirdler, Minneapolis, Minn.

Making Crates of Maximum Strength

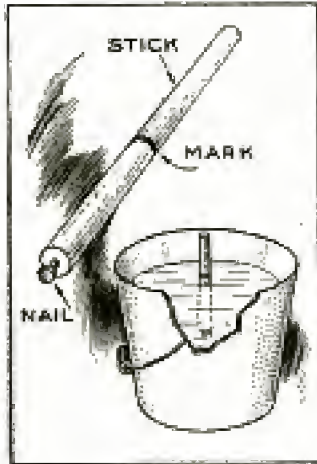
The annual waste and damage that are the direct results of packing and shipping goods in improperly made cases and crates amount to a staggering total. It has only been within comparatively recent times that serious thought has been given to



the matter of correct packing and crating. In most boxes and crates, it will be noticed that a great deal of the box is fastened together by driving the nails in parallel to the grain. This is all wrong, and should be avoided, because the nails will pull out readily. The best way to get the maximum strength at the corners of a box or crate, where it is most needed, is accomplished by arranging the pieces at the corners in either of the two ways shown in the drawing, and driving the nails into the wood at right angles to the grain.

A Stick Hydrometer

Due to the rapid evaporation of alcohol from the antifreezing solution in the automobile radiator, the owner is never quite



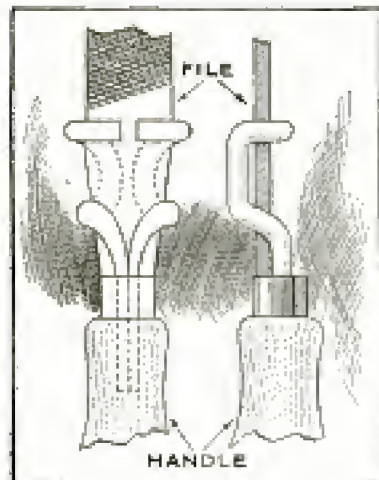
certain as to the efficiency of his alcohol-water mixture, without frequent tests.

A simple test gauge, operated on the same principle as a hydrometer, can be made from a circular stick of wood, with a nail driven into one end to hold it upright. The proper alcohol-water mixture

is made up, and the stick is inserted into the bucket, the depth to which it sinks being marked. The stick is kept either under the seat of the car or in the garage. Whenever there is any doubt as to the percentage of alcohol in the water, it is tested, and alcohol added until the test gauge sinks to the previously marked level.

Flat-File Attachment

It is not generally known that a handle placed on the front end of a flat file greatly facilitates its use. Anyone who



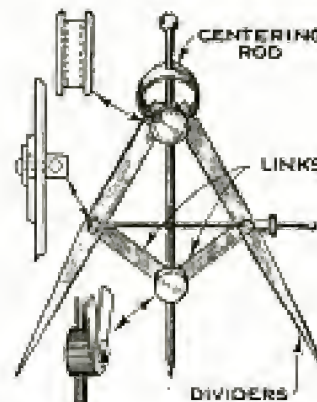
has used a flat, rough file for any length of time knows how awkward it is to keep on filing after the left hand has become sore and blistered from the continual contact with the file's rough surface. A good method of attaching such

a handle is to bend a piece of drill rod to the shape shown in the drawing. After bending, grind off half the diameter of the two ends so that when brought together they can be driven tightly into a hole drilled in the wooden handle. The piece is then split at the front to form a spring grip. The front or split part of the at-

tachment should be much narrower than the width of the file, so that when it is pushed on there will be sufficient tension to grip the file tightly. The lines showing the teeth on the end of the file have been omitted from the drawing for the sake of clearness; it is not necessary to grind off the teeth, although it may be found advisable to grind the edges of the file to a more abrupt taper. The size of drill rod to use will depend largely upon the size file with which it is to be used, $\frac{1}{4}$ to $\frac{5}{16}$ -in. stock being sufficiently heavy for 8 to 12-in. files.

Self-Centering Dividers

A pair of machinists' dividers can be made self-centering by the simple addition of a perpendicular centering rod and a link arrangement, by means of which the rod is



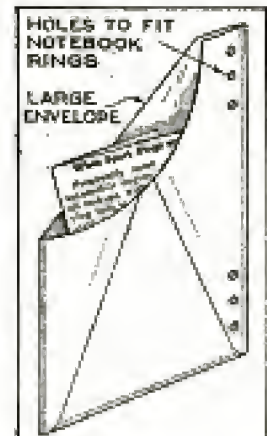
always held at the center. A hole is drilled through the spool and bow for the center rod, which is free to move vertically. This rod passes through a hole in the stud riveted at the center of the links. The links

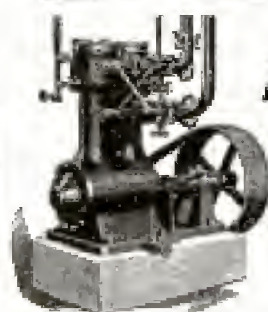
are fastened to the legs of the dividers, and, as the adjustment is changed, move up or down the centering rod.—Albert Hochheimer, West, Ia.

Pocket for Loose-Leaf Notebook

For carrying clippings, and similar small notes, in a loose-leaf notebook, a pocket can be added to the book, which will keep them all together and prevent them from dropping out each time the book is opened.

A heavy envelope of the right size is sealed and then cut as shown, the proper number of holes to fit the notebook rings being punched in the edge. If possible, metal eyelets should be inserted in the holes to add to the strength of the pocket and prevent its being easily torn out of the book.





Repairing Small Ammonia Compressors

BY J. V. ROMIG

OWNERS of small ice plants are usually rather chary of undertaking the overhauling and repair of their compressors, although many are quite competent to perform the repair work if they understood just how to go about it. It is to give this instruction to owners, or repairmen unfamiliar with refrigeration equipment, that this article is written.

The first thing necessary is to go over all pipe connections, studying the plant thoroughly, until the operation of each part is completely understood, and a firm grasp of the method of controlling the ammonia obtained. It is surprising how easily the ammonia is made to do as de-

and 2 show cross-sectional views of two typical compressors; these should be studied carefully so that the instructions may be followed intelligently.

When the desired temperature has been obtained in the storage boxes, ice-cream cabinets, ice tanks, or whatever the machine may be cooling, pump a good vacuum on the system, then close the line suction valves, one of which is shown in Fig. 3, and pump down again. Stop the compressor, then close valves A and B, Fig. 3, as tight as possible. There is now no pressure on the suction side, and the pressure remaining on the high-pressure side of the cylinder may be by-passed

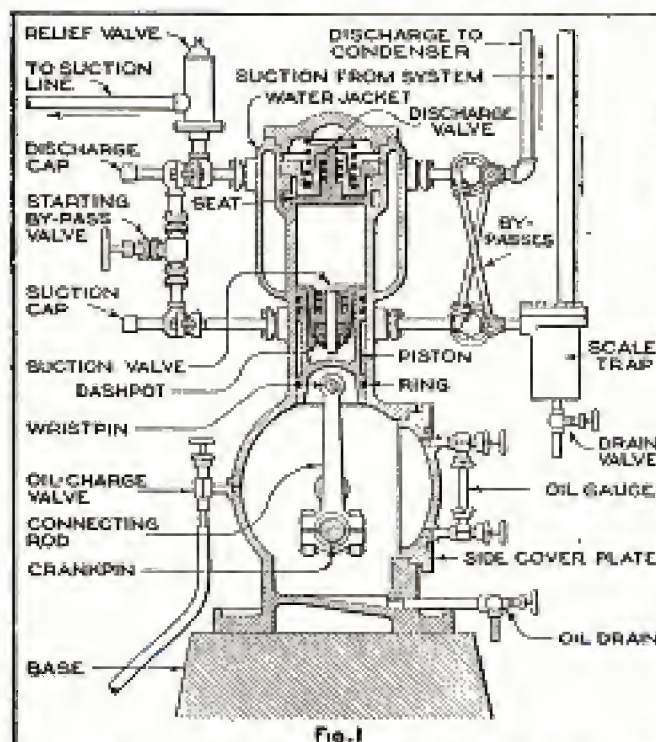


Fig. 1

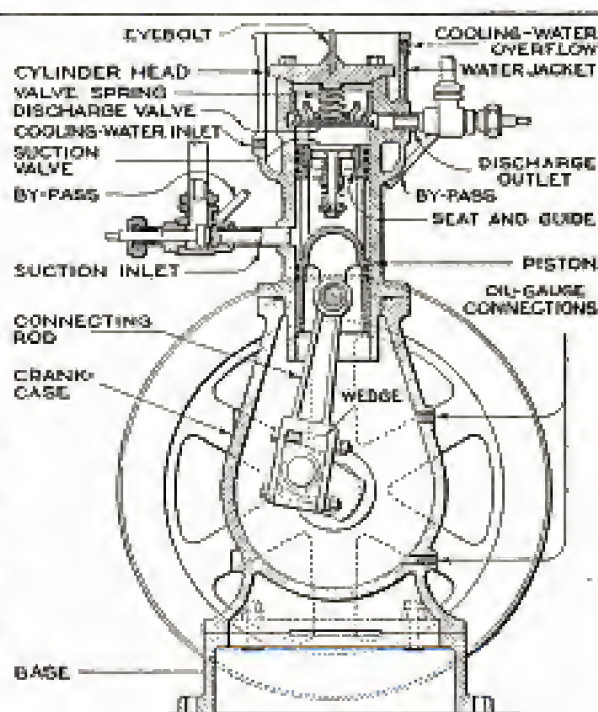


Fig. 2

Sections through Typical Small Single-Acting Ammonia Compressors: Note Carefully the Arrangement of the By-Passes, Suction and Discharge Valves. The Cross By-Pass Valves are Closed at All Times When the Machine is Running

sired, when the operation of the system is understood.

Compressors should be thoroughly examined and overhauled at least once a year, and the winter is the best time to do this, as, once the desired temperature has been attained in the cold-storage room, it will remain at a low degree much longer than in a warmer season. Figs. 1

by opening the starting by-pass valve E, Fig. 3; the pressure will then equalize on both ends of the cylinder. Place a bucket of water below the hose on the oil-charge valve, Fig. 1, open the valve, and the ammonia in the cylinder will be absorbed by the water. Do not keep the hose in the water too long, or all the ammonia will be absorbed by the water,

and a vacuum may form in the cylinder, drawing in some of the water, and requiring subsequent sponging. Drain the oil from the crankcase, then take off the side cover plate and the cylinder heads; very little smell will be noticed if the instructions have been carried out carefully. Remove the connecting-rod nuts, caps, and shims, and turn the flywheel until the pistons are at the top of the stroke; then the discharge valve and false head, if such is fitted, can be removed, eyebolts inserted into the piston head, and the pistons and connecting rods drawn out. Carefully examine the suction-valve seats; if pitted badly, they must be reground, using fine emery and oil, as in grinding in automobile-engine valves. See also that the balancing springs on the suction valves exert just enough force to overcome the weight of the valves and dash-pot plungers; if they are too "light," remove the cage, take out the valve, and stretch the spring until the proper tension is secured; if the spring holds the valve off its seat, compress it a little. Clean out any scale or grit that may be found around the piston cavities, then take the slip ring, used to compress the piston rings when inserting the piston into the cylinder, and slip it half over each ring in turn, observing how much the ring is open at the gap when compressed. If the gap measures more than .02 in., new rings should be fitted.

Rings that have an angular oil groove

not in line when inserting the piston into the cylinder, and that they stay staggered. Next examine the discharge valve; this usually shows some pitting, due to particles of scale getting between valve and seat; if necessary, regrind to a continuous surface with emery and oil. By a continuous surface is meant one in which there may be some pits, but which do not overlap each other, so that the valve will not leak. Too much emphasis cannot be laid upon the necessity of doing this part of the work well; the writer has found that very many cases of poor operation were due to bad high-pressure seats.

Replace the pistons in their proper cylinders, and, by turning to the top of the stroke, see how much clearance there is between the piston head and the top of the cylinder walls; if this is more than .02 in., the top halves of the connecting-rod bearings are worn, and should be replaced. Too great clearance is also a prolific source of inefficiency, as the space holds a comparatively large volume of highly compressed gas, and allows it to expand on the downstroke, partly filling the cylinder. Allow as little clearance as possible without permitting the metals to touch. All bearings should be tested for wear by placing a pinch bar under the shaft, in the case of the shaft bearings, or under the cap, in the case of the connecting-rod bearings, and, using a block as a fulcrum, raising the shaft or piston

assembly; the bearings must be tight enough so that no play will be felt. If too much end play exists in the crankshaft, this can be taken up by a fiber washer, placed between the cover plate and crank web.

The key in the flywheel should be tested for shake, as it is very likely to work loose; if allowed to run when loose, it will develop a bad knock. Remove all accumulated dirt in the crankcase, and reassemble. After assembling, turn the machine over slowly to see that everything is clear, then pump out the air entrapped in the cylinder through the discharge cap, Fig. 1.

If, while the machine was open, a leak in either of the main control valves A or B, Fig. 3, was noticed, it will be found neces-

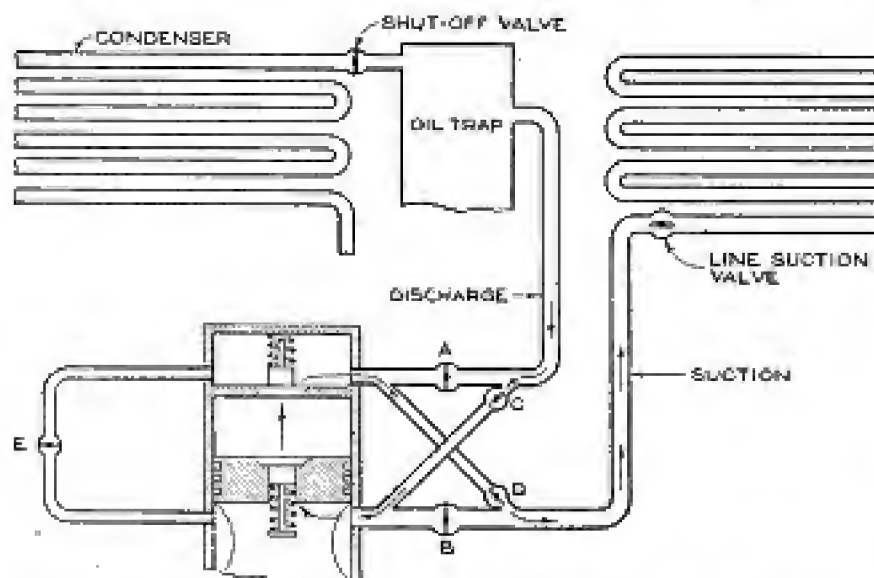


FIG. 3

Diagram of the Pipe Connections: The Arrows Show the Direction of the Gases When Pumping from the Discharge Side to the Suction Side

cut in the outer face give the best results, and should be fitted so that the gap is no wider than .006 in. "Stagger" the gaps, that is, see that the gaps are

sary to reseal these valves; to do this, the stems and bonnets must be removed, and the ammonia must be prevented from escaping while the valves are open. To repair valve A, proceed as follows: Close the shut-off valve between the cylinder and condenser, close also valves A and B, and open the cross-bypass valves C and D; run the machine until the oil trap frosts up well. This pumps the gas from the discharge side, through the by-passes, into the suction side, as shown by the arrows. Close valves C and D, then the bonnet and stem may be removed from valve A.

It will probably be found that the lead seats are spun up, as shown in the center drawing of Fig. 4, which shows a double-seat valve head. To reseal, heat the head with a blowtorch until the lead melts and flows freely in the groove. Add a little new lead, and skim off the oxidized surface lead. If care is exercised, both seats may be renewed without unscrewing the two parts of the head, but the repairman with no experience in this work will probably find it better to unscrew the head and repair each seat separately. When replaced in the valve body, screw tightly in place, and use a monkey wrench on the valve wheel when seating for the first time; this will make a tiny circular impression on the new seat, and it will hold tight. If the valve has a steel disk instead of a soft seat, regrind as instructed for the cylinder valves.

To repair valve B, pump a vacuum on the system, close the line suction valves, and again pump a vacuum. Now close valve A, after stopping the compressor, and the line between the cylinder and the line suction valve will have no gas in it. Open valve E, and dissipate the gas in water as explained before; valve B can then be opened and repaired. When replaced, pump out the entrapped air through the discharge cap and replace the cap before opening valve A. These valves should be repacked when dismantled, and a little oil applied on the stem and threads. Various types of globe, angle, and expansion valves are shown in Fig. 4; with

what has been said, no trouble should be experienced in repairing any of these. One thing should be borne in mind, however; when placing valves on a line, always present the bottom of the seat or disk toward the source of the greatest pressure, that is, always have a valve shut

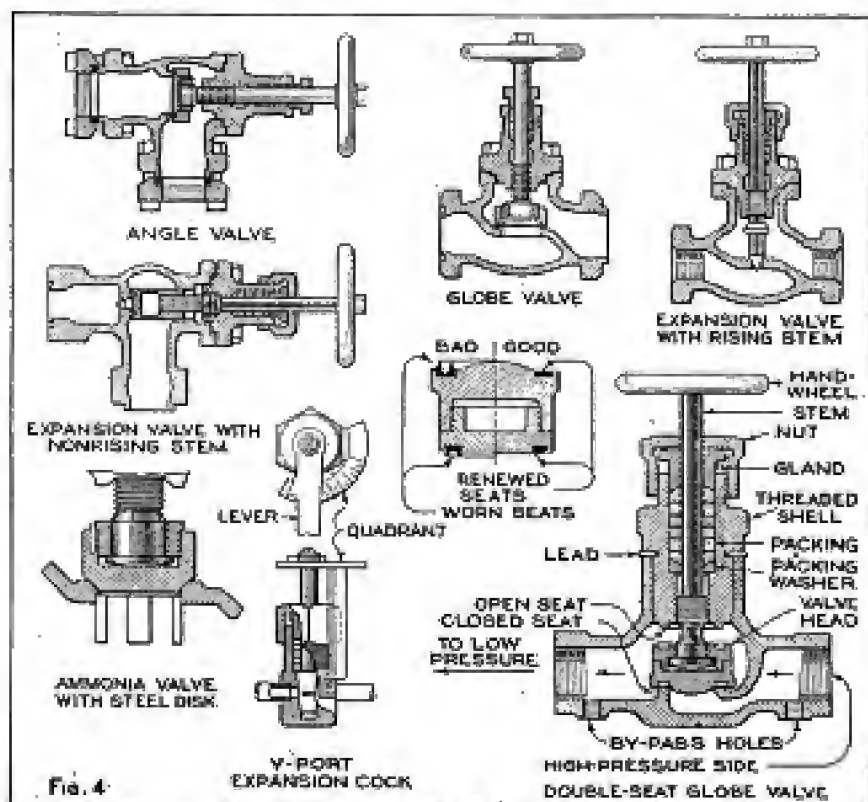


Fig. 4. Sections of Typical Globe, Angle, and Expansion Valves: The Center View Shows the Head of a Double-Seat Valve

against the pressure; if the pressure comes on top of the valve, the stuffing box will be under pressure always, and it will be difficult to keep it from leaking.

Examine the crankshaft stuffing box and repack, placing the new rings with the gaps staggered, to prevent leakage; it is well to smear the new rings with a little thin graphite grease.

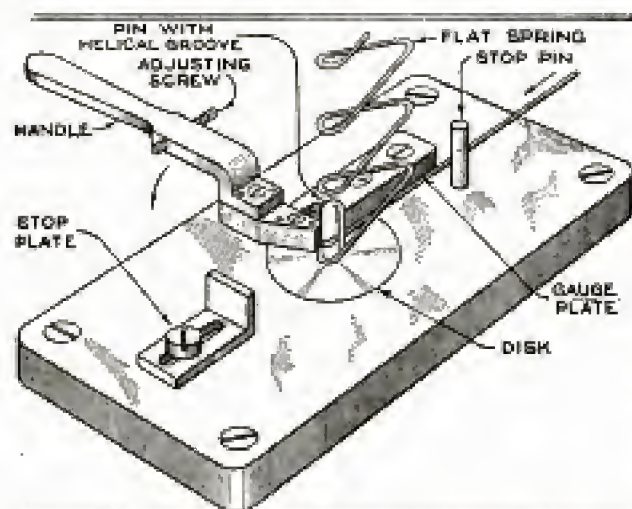
Before starting up an overhauled compressor, pour in a new supply of ice-machine oil, bringing the level up to $\frac{1}{2}$ in. in the gauge glass. Be sure to get the proper kind of oil, as any oil which has not a low freezing point will cause endless trouble.

Another point worth noting is to renew all cotter pins; cotter pins may be bent more than once without breaking, but use new ones, and be safe.

Do not turn any valve, or open any part, on an ammonia compressor, without tracing over every part of the system, or without being sure what the effect will be, and also be sure that there is a near and free exit, so that a quick escape may be made if the gas comes out too strongly.

Fixture for Forming Flat Springs

The drawing shows the construction of a fixture for forming flat springs quickly, conveniently, and uniformly. A bedplate,



A Fixture for Conveniently and Quickly Forming Specially Shaped Flat Springs Uniformly

which may be of cast iron, is machined and provided with screw holes at the corner for attachment to bench or table, and a hole is bored out at the center to receive a steel disk, which should be a free-running fit, but without shake. A drive-fitted pin is inserted into the center of the disk. A helical groove, with a pitch equal to that desired in the spring, is cut into this central pin. A gauge plate is fastened to the plate for guiding the wire and for preventing vertical movement of the disk. A sliding, adjustable stop plate is also provided, to make the spring of uniform width. The forming handle is fastened to the disk and should stop against the gauge plate, as shown; as the handle must clear the center pin and stop plate, it should be offset, and provided with an adjusting screw which comes into contact with the stop pin, and serves to keep the coils of the spring parallel.—S. H. Johnson, Westville, Conn.

Efficiency of Wood Fuels

Two pounds of dry wood of any non-resinous species have about as much heating value as a pound of good coal. A ton of coal may be taken as the equivalent in heating value of a cord of heavy wood, $1\frac{1}{2}$ cords of medium-weight wood, or two cords of light wood.

The following is an approximation of the number of cords of seasoned wood of various kinds needed to give the same amount of heat as a ton of coal, on the basis of 80 cu. ft. of wood, with a mois-

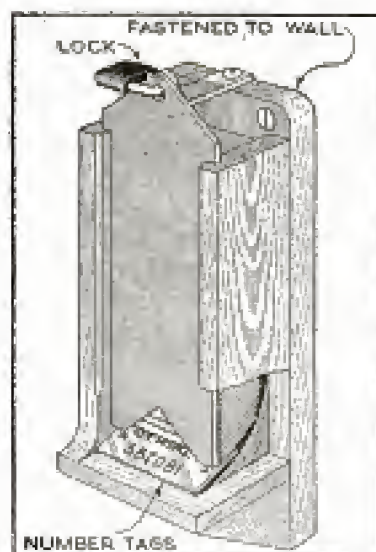
ture content of 15 to 20 per cent to the cord: one cord of hickory, hard maple, beech, birch, oak, ash, elm, locust, long-leaf pine, and cherry; $1\frac{1}{2}$ cords of short-leaf pine, Douglas fir, western hemlock, sycamore, red gum, and soft maple; and two cords of cedar, cypress, redwood, basswood, poplar, catalpa, spruce, and white pine.

Resin gives twice as much heat as wood, weight for weight. Hence, such woods as the pines and firs have more heating power per ton than nonresinous woods. The resinous woods in the list are considered as having an average amount of 15 per cent of resin.

The fuel value of the wood depends in many cases not alone upon its heating power, but also upon such qualities as easy ignition, rapid burning, freedom from smoke, and uniform heat. As a rule, soft woods burn more readily than hard woods, and light woods more readily than heavy woods. The pines give a quicker, hotter fire, and are consumed in a much shorter time than birch, whereas birch gives a more intense flame than oak. Oak, however, gives a very steady heat.

Case Holds Tags Numerically

An adaptation of the device shown in the drawing can be used to deliver con-



secutively numbered tags or plates, such as used for marking machinery, automobiles, and the like, and is suitable for the accommodation of plates that are made up and stored in advance of the parts being made.

The holder is made from hardwood with a compartment the exact size of the plates, the lower end of the slot being curved, as shown, so that the plates will move forward and downward as the bottom one is removed. A sliding front that fits into grooves in the sides is removable for replenishing the supply of plates; to prevent tampering with the contents, the holder can be locked.—G. A. Luers, Washington, D. C.

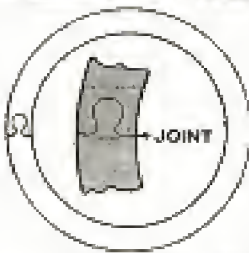
Castings for Six-Inch Bench Lathe

In response to our request, Mr. J. V. Romig, the author of the article on "Making a Six-Inch Bench Lathe," published in our October issue, has kindly consented to furnish the necessary castings for this lathe, to any who contemplate building one. They will, of course, be rough castings, and the price will be nominal; if machined castings are ordered, a higher charge will be made to cover the cost of the work.

Further information may be obtained by writing to the editor of this department.

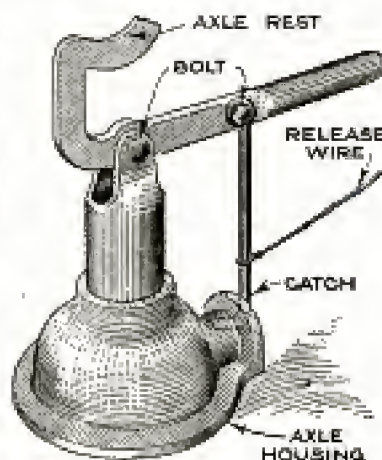
A Gasket Lock Joint

When the pressure-head gasket blew out of the hoisting cylinder of an ash hoist, just at the time of day when it was most needed, a delay of several hours would have been necessary to have removed the piston-rod cables, sheaves, and other parts, to replace a solid gasket. However, by cutting the gasket joint as shown, a non-slipping splice was made, and the job completed in less than half an hour.—U. S. Sprout, Lancaster, Pa.



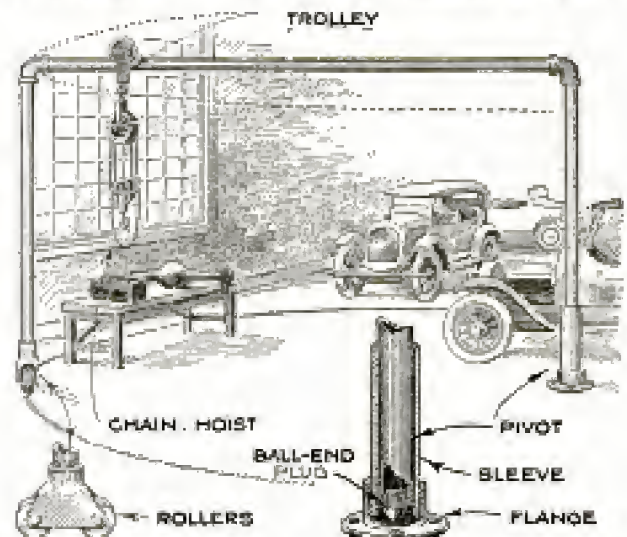
Jack Made from Axle Housing

Jacks around the service station are often "borrowed" without being returned. To avoid the cost of providing jacks for those lost in this manner, one station used jacks of the type shown in the drawing; these were made in their own shop. Sections of the axle housing of light automobiles were used, cutting them as shown and fitting a forged lifting bar and hook, to hold the jack in its raised position. Such jacks are always returned, as they are too large to fit in the tool box or under the seat of an auto.



Radial Shop Crane

A crane suitable for the garage and machine shop, that involves no structural changes in roof or wall beams and re-

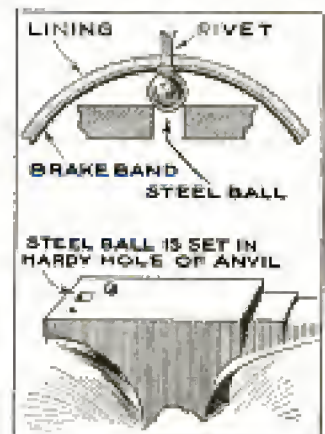


A Radial Shop Crane for the Garage and Machine Shop That can be Pushed to Any Point of Its Circular Path

quires no separate guides, is constructed, as illustrated, from pipe, making it sufficiently simple and inexpensive for any shop, even though it be used infrequently. A center pivot, consisting of a section of pipe and a closed-end floor flange, supports one end of the crane in the manner shown in the detail. The outer end of the crane is supported upon rollers so that the device can easily be pushed around.

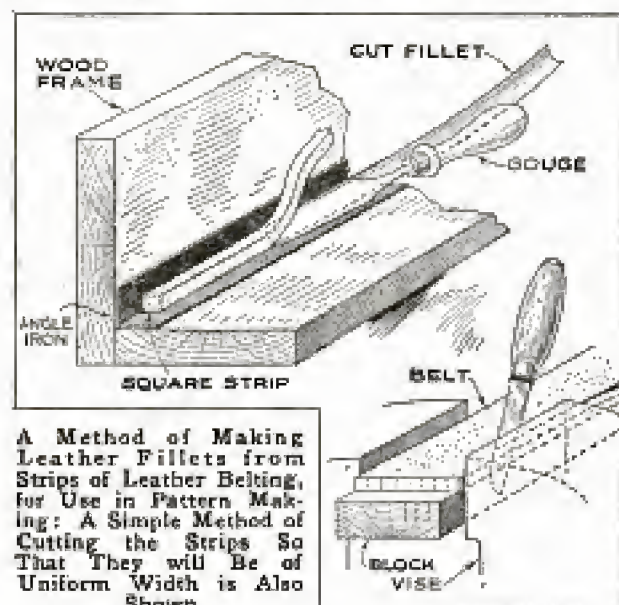
Brake-Lining Fixture

The usual method of riveting new lining to the brake and transmission bands of automobiles consists in clamping a punch in a vise, to back up the rivet while the head is being upset with the hammer. This requires considerable effort to keep the punch and rivet together. The idea illustrated by the drawing makes the riveting job somewhat simpler and requires nothing more than a large steel ball, placed in the hardy hole of an anvil. The rivet is set on this, and the end hammered over. The first blow makes a small depression in the rivet, and the ball rests in this.



Making Leather Fillets for Wood Patterns

Leather fillets glued into the corners of wooden patterns are often used, and while they may be bought ready-made, it is oc-



asionally necessary that a special size be made in the shop.

A good method is to cut an old leather belt into strips of square cross section, in the manner illustrated in the lower part of the drawing. A wooden block, the same width as the belt, is clamped in a vise, the top of the block being lower than the tops of the vise jaws. A knife is then stuck into the block, at a distance from one of the jaws equal to the required width of the strip, and the belt is pulled through, as shown, cutting off one strip. The block is now planed down to the width of the remaining piece of belting and the operation repeated. Thus the strips will be of uniform width.

A form is then made by nailing together two pieces of board at right angles, with a right-angled strip of heavy tin or sheet iron nailed into the corner. One of the square leather strips is placed in the corner and either a gouge pushed along it while holding one end of the strip, or the gouge is held stationary and the leather strip pulled against its edge. If the resulting fillet is a little rough, it may be smoothed by wrapping fine sandpaper around a hardwood dowel and rubbing it along the surface of the leather, still held in the corner of the form; or it may be sandpapered after being glued into the pattern.

Another way to make such a fillet is to glue the uncut square strip to the pattern and hold it in place temporarily by driving

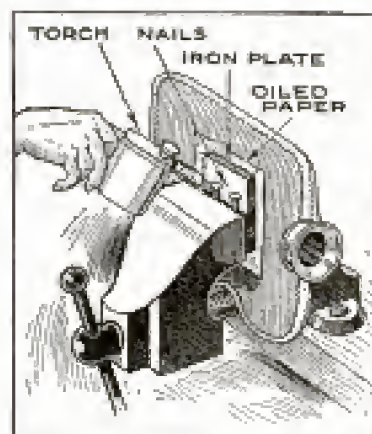
in a series of brads diagonally, allowing the heads to project. When the glue has set, the brads are pulled out, and the strip is cut with the gouge, and sandpapered. If a fillet is glued into place after being cut to shape, it is usual to press it down into position by means of a small rod, with a brass ball on the end, of the same radius as the fillet.—H. H. Parker, Oakland, Calif.

Tap Wrench Aids in Using Breast Drill

When drilling with a breast drill, to overcome the catching of the drill that necessitates backing it up, the following remedy is a good one: Take a tap holder from a set of taps and dies, slip the shank of the drill through the tap holder, and tighten down as when holding a tap. Allow enough of the drill shank to stick through to engage in the drill chuck. The tap holder now acts as a flywheel and the centrifugal motion carries the drill past the little catches unnoticed; the drilling is thus made much easier.—Orin C. Watkins, Salem, Ore.

Vulcanizing without a Vulcanizer

Repairing slits in boots, hot-water bottles, or similar rubber goods that are too large to fit into one of the small gaso-



line vulcanizers, used for mending punctured automobile tubes, is done with the makeshift vulcanizing apparatus shown in the drawing. The surface around the slit is treated as in patching

a tube; that is, it is cleaned with gasoline for a generous distance around the aperture and the surface roughened slightly with sandpaper. A good coat of vulcanizing cement is applied and allowed to dry for a few seconds, and a neat patch of vulcanizing rubber is put in place and smoothed down until it adheres evenly.

Then, taking two sheets of iron, as near the size of the patch as possible, one is placed against the patch and the other on the opposite side of the article

being mended. A piece of waxed paper is placed between the plate and patch to prevent sticking. The whole is then clamped in a vise, as shown in the drawing, using a couple of nails between the vise jaw and the iron plate, to permit a free play of flame from the alcohol torch used to supply the heat. The flame is kept playing on the plate against the patch, which is kept hot for about 10 minutes, then allowed to cool for another 10 minutes before removing the work for inspection. — Harry W. Poor, Boston, Massachusetts.

Tool for Inserting Auto Universals

The tool shown in the drawing will be found of particular value in automobile garages and service stations making a specialty of light-car repairs; it is used for inserting the end of the universal joint into its socket in the transmission.

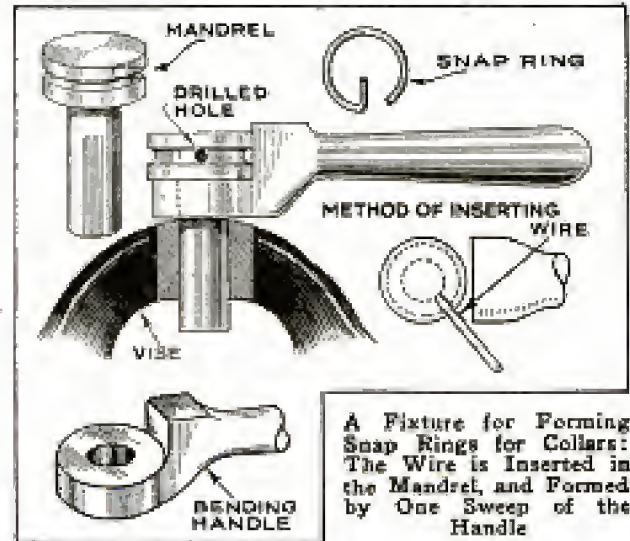
Two sheet-iron plates, triangular in shape, are hinged together at one side, as shown, and a square opening, the size of the universal-joint shaft, is cut in the center. Old valves, welded or riveted to the separate plates, are used for handles. With the tool in position around the universal shaft, the latter can be turned and centered so that it can be inserted into its socket in the transmission.

Motoring through Snow

When driving an automobile through deep snow, it is well to remember that letting some air out of the tires will give a broader traction surface; this is as efficacious in sand as in snow. While tire chains usually are effective, the wheels will sometimes spin; and it is advisable for the winter tourist to carry a pair of mudhooks for such occasions. Do not get alarmed if the radiator boils, so long as it contains enough water to cover the cylinder heads. Snow can be melted for the radiator by placing a bucket full under the radiator drain cock, and allowing some of the hot water to flow into it.

Snap-Ring Bending Fixture

The fixture shown in the drawing may be made in any machine shop at but slight cost, and will be found very useful in

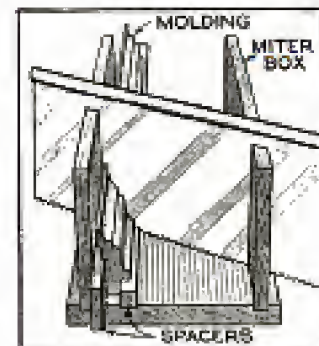


forming snap rings for collars used on small shafts, and for various other purposes. A circular mandrel is turned with a grooved collar, and a hole, slightly larger in diameter than the diameter of the wire used, is drilled in the center of the groove. Flats are filed on the mandrel shank to prevent it from turning in the vise.

A handle, the boss of which is bored to fit freely on the shank of the mandrel, is shaped as illustrated, and the fixture clamped in the vise. The wire, cut to length, is inserted in the hole in the mandrel, and one turn of the handle completes the ring.

Mitering Odd-Shaped Molding

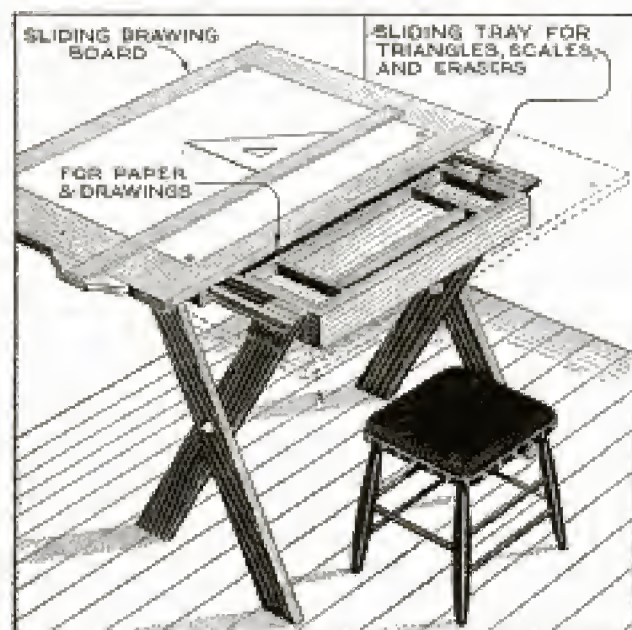
Cutting molding that has a very narrow back, although full and round in the face, is somewhat difficult because the work rocks and slips on its narrow base. The easiest and surest way of making a correct miter, or joint, is to slip in strips of wood of suitable thickness between the sides of the miter box



and the work, to provide a support for the latter, as shown in the drawing. If a great deal of molding of one style is to be cut, these strips can be permanently attached to the miter box.

Novel Arrangement of Drawing-Table Drawer

The illustration shows a novel method of attaching a drawer to a drawing table, in which the drawer, instead of the board, is attached to the legs. The reason for



A Novel Arrangement for a Drawing Table: The Drawer is Fastened to the Legs, and the Drawing Board Moves Back over It

this is, first, that it is not necessary to move back when opening the drawer, and, second, that the drawer, being usually filled with books and paper, is much heavier to move than the top. Furthermore, the board is often tipped up at the back so that the drawer is disposed to slide out, and, as the drawer has considerable depth, the supports are more conveniently attached. A sliding tray is made to receive scales set on edge, so that one may be selected conveniently with a very slight opening of the drawer. The divisions in the sliding tray can be made to meet the requirements of individual cases.—G. M. Beerbower, Tarrytown, N. J.

Soldering Jewelry

It is of first importance that soft solder be avoided as far as possible in repairing articles of gold and silver, and even filled and plated jewelry can be repaired with hard solder. To repair a ring, the shank of which requires soldering, bury the setting in a crucible of wet sand, place a small piece of charcoal against one side, and coat the break, previously cleaned by scraping or filing, with borax; charge with solder and blow a flame against the ring until the solder runs in.

Articles that require protection against

discoloring in the process of soldering, should be coated with a mixture of burnt yellow ocher and borax, adding a little gum to make it cover the article completely. Allow it to dry, charge with borax, solder, and boil in a weak pickle composed of nitric or sulphuric acid in water. One important point is to wash the piece well in hot water, with a little ammonia added, to remove any dirt and grease, before undertaking any repairs.

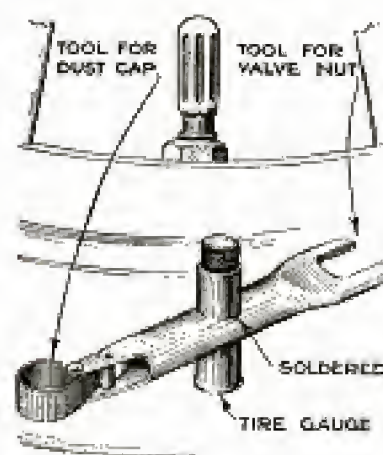
If the article is made of colored gold, boil out in a pickle of muriatic acid and water, but never coat with any protecting mixture. To repair gold-filled work, melted solder is required; this may be made in the proportion of 1 oz. fine silver, and 10 dwt. hard brass wire, to which 2 dwt. of zinc is added just before pouring. Or, for strong silver use only the silver and brass.

For repairing most bright gold work, use an alloy composed of 3 dwt. fine silver, 3 dwt. gold, and 2 dwt. fine copper.

A good solder for soldering spectacle frames or other steel parts is made by melting together equal parts of silver and copper.—Geo. M. Millard, Toronto, Ont.

Tools for Valve Combined with Tire Gauge

A tire gauge, used in an eastern tire-service station, was incorporated into the



three-in-one tool illustrated. This tool can be used for gripping the dust cap or valve nut, according to the end used, and is made by drilling a hole through a piece of thin steel tubing and soldering the tire pres-

sure gauge in this hole. One end of the tubing is flattened, and a slot cut to fit around the valve nut. At the opposite end, a strip of sheet brass is riveted to form a toggle that takes a tight hold of the dust cap.

E. A. Luero

■ Pure Venetian red is the most durable color known for outside woodwork. If applied with pure linseed oil, it will last as long as the woodwork.

Moving Big Trees Economically

By A. M. HUSTEAD

HAVING obtained a contract for moving several large trees from their original location to another, a landscape-service firm successfully accomplished the work without the use of special apparatus. For the transportation of a 16-in. hard maple, a trench was dug around the tree at a distance of about 4 ft. from the trunk and about 4 ft. deep, or to a depth sufficient to catch most of the surface roots. During the time the tree was being dug loose, it was well guyed to pre-

pulleys, cables and a check rope, to prevent a too sudden drop into the hole, as this might cause the ball to crack, with ultimate loss of the tree.

After the tree was in place, the dirt was backfilled, thoroughly tamped, and puddled in with a stream of water. It is of the utmost importance that the earth be well tamped around the ball and that no air pockets be allowed to form, as these are detrimental to root function, and will, therefore, retard the normal growth.



Showing the Method of Trenching around the Tree and the Appearance of the Root Ball: Many of the Feeder Roots are Cut in This Operation, and This Requires a Subsequent Thinning Out of the Branches



vent it from falling over. The ball of earth around the roots was allowed to freeze until it could be moved without danger of cracking, or losing the earth from around the roots. When the ball was frozen sufficiently, the tree was tilted back and plank skids placed underneath; then, when the tree was "loaded," it was pulled out of the hole by means of suitable tackle and dragged to its new location by a truck.

The hole into which the tree was transplanted was dug with an incline from the bottom to the surface so that the tree could be slid into position by means of



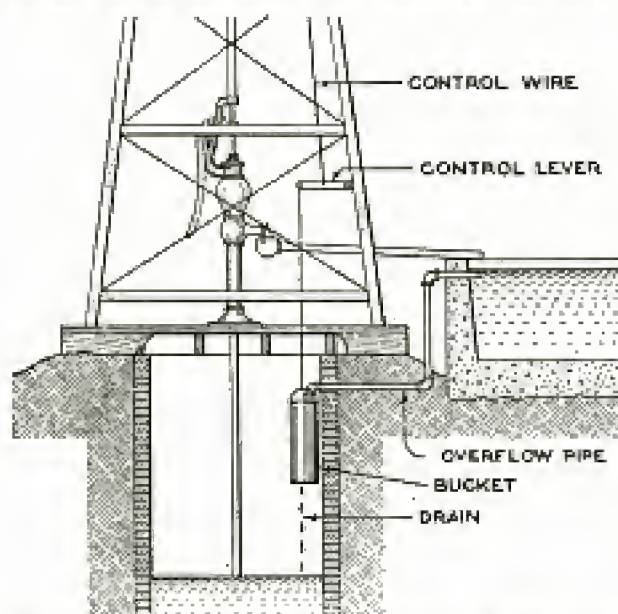
Above, the Tree being Dragged to Its New Location by a Motor Truck: The Root Ball must be Frozen So Solidly as to Avoid Splitting It or Losing Earth around the Roots. Left, Lowering the Tree down an Incline into the New Hole: A Check Rope around the Ball Prevents a Too Sudden Drop

In moving a tree, many of the feeder roots are necessarily cut off, and this will require thinning out the branches. From this particular tree two wagon loads of brush were removed without spoiling its original symmetry.

It is well to remember, when round holes are to be accurately sized, that the properly designed round broach has demonstrated its value for this work even in comparison with roughing and finishing reamers. The work is produced at a greater speed and a considerably lessened cost for tool maintenance.

A Simple Windmill Regulator

Many devices have been applied to windmill-driven pumps supplying water to tanks, to regulate automatically the operation of the windmill as the water in the tank becomes too high or too low.



An Automatic Regulator for a Windmill-Operated Pump on the Farm That Keeps the Tank Filled with Water at All Times and Prevents Overflowing

Most of these arrangements are operated by a float or other device in the tank, and are easily rendered inoperative if the float leaks, or the mechanism rusts.

The arrangement shown in the drawing suffers from none of the shortcomings of floats. A 5-gal. cream can is suspended in the well from the end of the control lever by means of a strong wire. A small hole in the bottom of the bucket allows the water to drip out so that it is emptied about every three hours. As the weight is released, the pump clutch is automatically thrown in, and water is pumped into the tank until it reaches the level of the overflow pipe, which drains into the bucket; as the bucket is filled with water the pump is automatically disengaged, so that the container is prevented from overflowing.—S. E. Gibbs, Corydon, Ia.

Deodorizing the Glue Pot

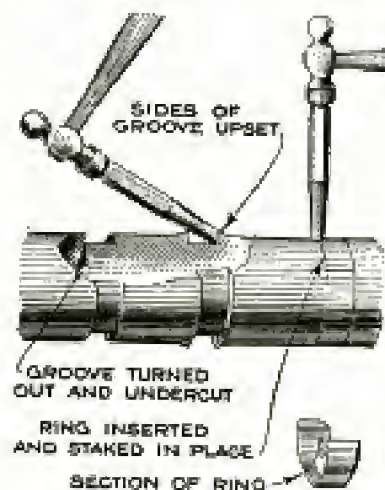
Quite often the glue pot exudes an odor that is almost unbearable; this is often caused by bad glue, but more frequently by the brush. Copper-bound brushes are the most desirable, and, when quitting work for the day, they should be taken out of the pot and hung up until the next morning. Only a few minutes are required to soften up the brush, and

when treated in this fashion, all or most of the disagreeable odor will disappear. While in no way affecting the adhesive qualities of the glue, a few drops of some oil, like oil of sassafras, clove, wintergreen, or cinnamon in the glue pot, is very effective in purifying the vapor arising from the glue.

Repairing Grooves Worn in Shaft

When a ring-oiling box is found that continues to give trouble from heating, it is generally because one of the rings has stopped turning at some time and worn a groove around the shaft; this groove prevents the oil brought up by the ring from being properly distributed, and, of course, the bearing will not be lubricated. These grooves are not usually noticed until the machine is taken down for repairs of some sort, as they are not noticeable so long as the machine is in operation. If the box is oiled by hand, it will run properly, but if the rings are depended upon to carry the oil, the bearing cannot help but run hot.

When grooves are found in a shaft, particularly if the bearing is an important one, it is essential that they be repaired. Sometimes a new shaft may be put in, but to do this, the machine will often be shut down when it is most needed. Also, the shaft may be turned down small enough to eliminate



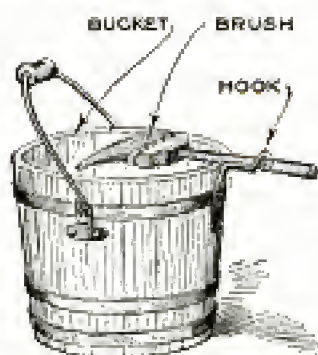
the grooves, but this makes a new bearing necessary, which is impossible in case the bearing is solid and a gear or pulley goes on the end outside the bearing.

Another method to bring the shaft back to its original condition in a short time is illustrated by the drawing. The grooves are squared out and slightly undercut, and a small punch is then used to bring the sides of the groove parallel by upsetting the metal above the surface of the shaft. A metal ring is turned up with beveled sides to fit into the dovetail groove in the shaft. The ring is sawed in half and the sections placed in the groove, the metal that was upset being staked

back in place to hold the ring securely to the shaft. If this operation is done carefully, the shaft will be the same size as before, and the ring can be turned to the exact diameter of the shaft, making it difficult to tell where the ring was applied. Small shims can be inserted to compensate for the metal removed when the ring was sawed. On very small shafts the ring can be held in place with solder, but this does not work so well on larger pieces.—James Ellis, Memphis, Tenn.

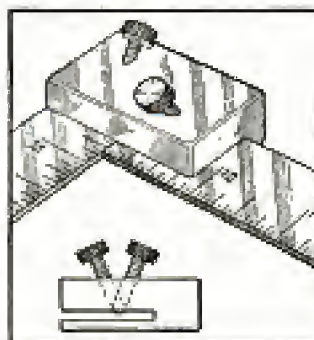
Calceiminer's Brush Holder

A holder, permanently attached to the calcimine pail in such a manner that the brush may drip into the vessel, will prove of convenience to the workman. A hook is formed, as illustrated, from a piece of round iron, flattened at one end and attached to the bucket with screws, if a wooden bucket is used, or with rivets, if a metal one. The handle of the brush rests on the rim of the pail and under the hook, where it may be instantly disengaged.—Jesse L. Blickenstaff, N. Manchester, Ind.



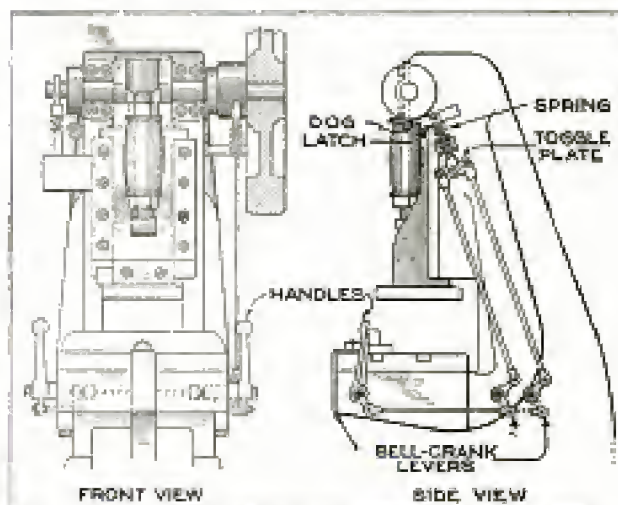
Making a Square from Scales

The drawing shows a convenient little clamp attachment whereby two ordinary machinist's steel scales can be converted into a square, or attached end to end to form a single long scale. The clamp is made from a block of flat steel, slotted to the desired depth to take the scales. The ends of the thumbscrews are turned to a conical point of such an angle that the conical surface is parallel with the face of the scale. It will be seen that with the screws in this position, the action of tightening them rolls the edges of the scales together automatically. Both screws have right-hand threads and knurled heads.



Safety Device for Punch Presses

A manufacturer has designed and installed on his punch presses a safety device that forces the operator to use both hands to trip the press, thus making



A Safety Tripping Device for Punch Presses, the Operation of Which Requires Both Hands, So That They cannot be Caught under the Descending Ram

sure that the employe's hands will not be under the ram when it descends.

The drawing shows the operating principle of the arrangement. A toggle plate, the center of which is connected to the tripping latch of the press, is controlled by rods hinged to each end. To cause the tripping lever to operate, both rods must move downward at the same time; if only one is moved, the toggle plate will turn about its center and impart no motion to the tripping latch.

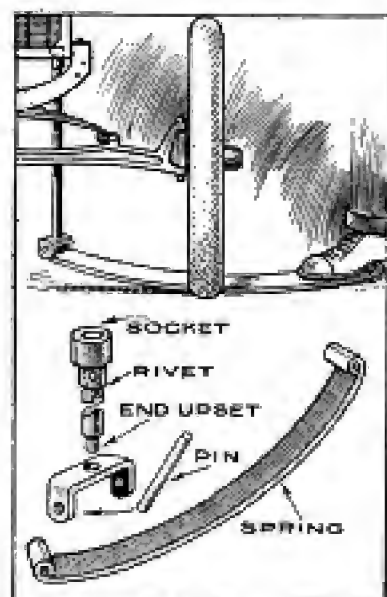
Two cast-aluminum handles, one on each side of the press, are pivoted on studs screwed into the press bed. The motion of the handles is transmitted to the toggle plate by $\frac{1}{4}$ -in. cold-rolled steel rods and bell-crank levers. The handle at the left-hand side transmits its motion to the toggle through a $\frac{5}{8}$ -in. cold-rolled steel shaft extending from the left to the right side of the press. Slots are cut in the toggle plate where the connecting rods are attached, so that the operator will have to push both handles far enough to trip the latch.

This type of safety tripping device is considered more satisfactory than the air-operated device, as its action does not depend upon the use of air pressure, or any other agency but the control of the operator.—Edward H. Tingley, Dayton, Ohio.

Overprinted blueprints can be bleached by flowing very hot water over them.

Holder for Crankcase Bolts

An improvised spring holder, that facilitates the removal or insertion of the crankcase bolts on certain types of automobiles, is shown in the drawing.



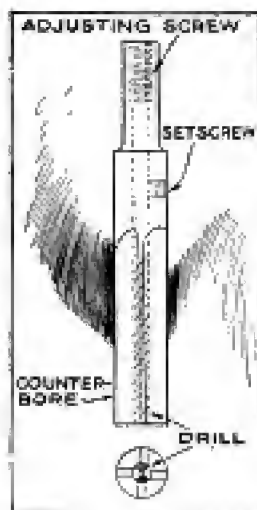
With such a tool, the bolt is prevented from turning, while both hands are free to place the nuts and washers in position and screw them down. There is nothing complicated about the device, which consists of a wrench socket, of a size to

hold the bolts, fastened to one end of an iron rod, which is hinged at its opposite end to an old auto-spring leaf.

In use, the end of the spring is held down with the foot, and this holds the wrench over the bolt head until the nut has been screwed down from above.

Counterbore for Square-Bottom Hole

The drawing shows a counterbore that was designed to make a flat-bottom hole in a case where a teat projecting from the bottom of the hole, as left by the ordinary flat-end drill, was not permissible. Usually, with a tool of this character, considerable trouble is encountered in keeping it sharpened, when it is made in one piece, as there is no clearance at the center. In the tool illustrated, a hole is drilled axially to accommodate a small drill, held in place by a setscrew, the thrust and compensation for



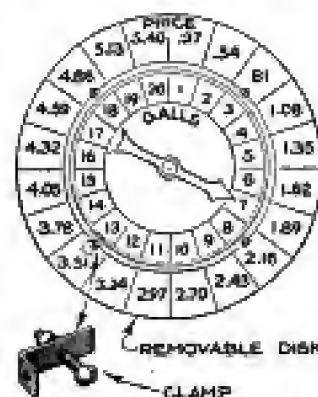
wear on the drill being cared for by the adjusting screw in the top. It is no great trick to grind a drill to cut a square bottom, and the clearance necessary to grind the body is provided by the axial hole.—John Homewood, Ontario, Calif.

Speed of Conveyor Belts

The National Safety Council recommends the following speeds for belts conveying loose material, such as grain or sand: for belts under 16 in. wide, a maximum speed of 300 ft. per minute, while 450 ft. per minute should be allowed for belts of from 16 to 24 in. in width. For belts wider than 24 in., a speed of 600 ft. per minute is permissible. Belts carrying packages are generally run no faster than 60 to 100 ft. per minute.

Price and Quantity Dial Calculates Cost of Fuel to Motorists

A garage proprietor selling gasoline to motorists has installed the calculator shown in the drawing on his gasoline-measuring pump, saving his own time and that of his customers.



The dial is made from a piece of tin of suitable diameter, in this instance about 8 in., with a pointer at the center. The disk is divided off into the proper number of segments, as illustrated.

The price for one or more gallons of fuel is indicated on the outer circle; the number of gallons is shown on the inner one. Of course, any changes in the retail price of the fuel will make it necessary to alter the figures on the outer circle to conform to the new price. Where prices are subject to frequent changes, cardboard circles can be lettered and applied to the sheet-metal disk with shellac. The device is attached to the measuring pump with small bolts and clamps similar to the one shown.—F. J. McMillan, Morristown, Ohio.

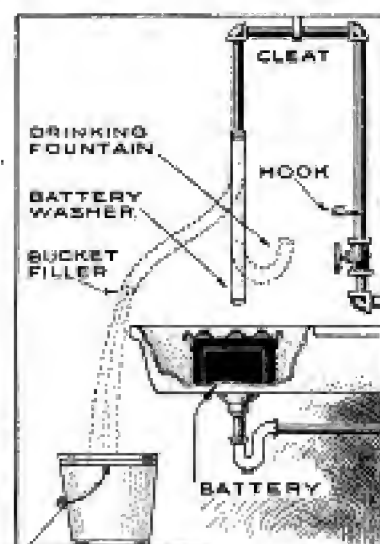
Machining and Finishing Ebonite

Ebonite, which is sometimes called vulcanite and hard rubber, and which is largely used for electrical purposes, is also of great use in the chemical industry, owing to the resistance it offers to chemical reagents. It is stable toward air, light, and changes in temperature up to about 175° F. It can be softened in boiling water and then bent and shaped as desired; the shape or impression is re-

tained on cooling, but if the material is subsequently softened by heat it will return to its original form. In machining it, the tool must be sharp, and to prevent overheating, the cut must not be too heavy. If the tool and the work are not kept cool, the former will rapidly lose its edge and the work will be burnt. In polishing ebonite, the surface should first be rubbed smooth with powdered pumice and then buffed, using a tripoli compound, and running the cloth polishing wheel at high speed, the work being held lightly against the wheel. In making ebonite, sheet-metal foils are used as a backing for the plastic material during the process of vulcanization, and this gives the finished sheets their well-known glazed appearance. Owing to the fact that this surface is slightly metallic it should be removed when the material is used for electrical work, else the insulation will be low, owing to surface leakage.

Battery Service-Station Aid

The arrangement shown in the drawing is one of the labor-saving features of a well-planned storage-battery service station. The



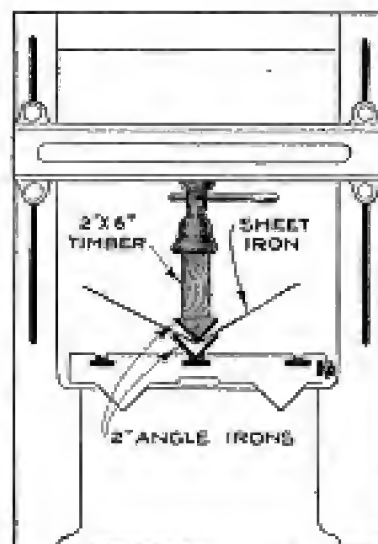
valve is fitted close to the wall, and from it the water-supply pipe is run overhead to a point about the center of the sink. A short vertical piece of pipe has a length of rubber hose attached to it, as in the illustration. When washing out battery cells, the hose can be swung to any angle. Other conveniences of this arrangement are that the hose can be used as a drinking fountain, or to fill buckets, as indicated by the dotted lines.

¶To remove a bolt that is "set" or "frozen," or that one has reason to believe cannot be driven out, use as large a wrench as can be handled and tighten down the nut, even if it twists off. This will stretch the bolt and reduce its diameter slightly so that it can be driven out with comparative ease.

Bending Large Sheets of Metal

In a case where several large galvanized-iron tanks were to be made, they were so large that two full-sized sheets of metal were required for the sides and bottom. These pieces had to be bent at right angles for their entire length and the ends riveted together on the bottom.

The problem was to bend these sheets to leave a square corner. To start at one end and bend as the work went along was first tried, but it was found that the metal stretched and warped, so



that this method would not answer. The planer was then rigged up as an angle press, and the results were perfect.

Two pieces of 2-in. angle iron were cut to the length of the sheet metal. One length was placed in the T-slot of the planer table and the stock laid on this. A triangular piece of wood was nailed to a 2 by 6-in. timber, 6 ft. long; this was placed on the second angle-iron strip, and a screwjack fitted between it and the crossrail of the machine. By turning the jackscrew, the sheet of metal was bent for its entire length in one operation, and no kinks were formed.—Edwin J. Bachman, Fullerton, Pa.

Drilling Tile

A contractor discovered that one of his men was drilling holes in tile bathroom fixtures about four times as fast as the other workers. Asked to explain his method, the worker demonstrated how cut nails were used in place of the ordinary twist drill. He filed the heads of two nails so that the nails would lie close together, and put them into his brace as he would a drill. He started the hole with the point of a screwdriver, or similar tool, and then applied the nails, which penetrated into the tile much faster and with less loss than the twist drill. When the nails become dull, they are thrown away and a new pair inserted.—Armstrong Perry, New York City.

Valve Grinder Made from Hand Drill

If an old hand drill, or breast drill, of the type in which the spindle runs up



through both bevel pinions and into the handle, can be obtained, it may be converted into a tool suitable for valve grinding. The gears are removed and the upper pinion pinned to the spindle. Then, over half of the teeth on the bevel gear are filed or ground off down to the root depth; a smooth surface should be

left even with the roots of the teeth to bear against the upper pinion. Enough gear teeth must be removed to prevent interference of one pinion with the other; that is, they must clear one pinion before starting to mesh with the other. As the spindle will now continually reverse its motion as the operating handle is turned, the drill chuck is likely to loosen, so it must be pinned or setscrewed, or removed altogether, and the valve-grinding tool be fastened directly to the end of the spindle.

Using Wood Alcohol

Great caution should be observed in the use of any mixtures containing wood alcohol. This is the most deadly poison used in daily commerce; one teaspoonful has been known to cause blindness, and one ounce, death. The poison may be absorbed into the body through the nose, mouth, or skin, so that even the inhalation of the fumes, or the contact of the liquid with the hands, or any other part of the body, may cause poisoning just as though the alcohol were taken into the system through the mouth.

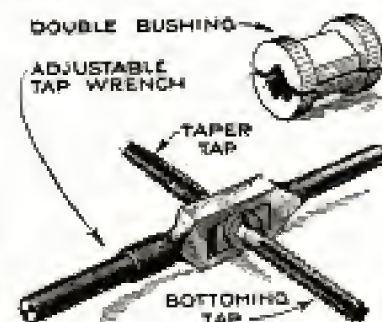
Sudden blindness, with vomiting and abdominal pain, should always cause suspicion of wood-alcohol poisoning, and no time should be lost in having the patient treated by a physician.

Denatured alcohol should be substituted for wood alcohol wherever possible, as this has no ill effect on the system.

It has been suggested that, in establishments using quantities of wood alcohol, the word "methanol" be used to label the liquid, as this describes the product specifically, while removing the tempting suggestiveness of the word "alcohol." This term, of course, should be accompanied by the word "Poison," as, even though the temptation to drink the liquid might be removed, the danger from absorption and inhalation would still be present.

One Wrench for Two Taps

By using a supplementary double bushing, of the type shown in the drawing, and placing this in a standard tap wrench

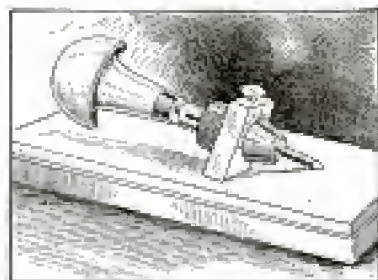


with an adjustable handle, two taps can be accommodated at one time. This is a very handy arrangement when a hole is to be rough

tapped. By using the taper tap to rough out the hole, it is only necessary to reverse the tool to complete the hole, using the bottoming tap. The bushing or holder can be made of any good grade of steel.

Gauge for Sharpening Gravers

It is a very difficult matter for users of gravers, such as those used in engraving metals, to get the correct cutting angle when sharpening them on an oilstone. This is so because the tool must be held at just the right angle, and not be allowed to rock. To overcome this difficulty, and, at the same time, make it possible to sharpen the tool at



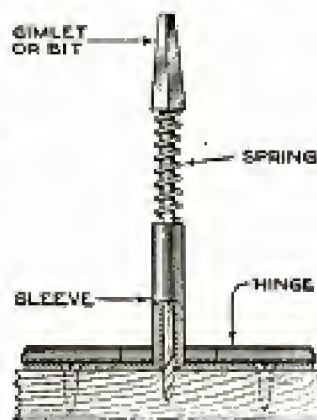
any desired angle, the tool shown in the drawing was made from a T-handle tap wrench. The handle was cut off, and a hole, large enough to accommodate the gravers, drilled along the axis of the wrench shank. A guide, made of steel, 1 in. square by $\frac{1}{4}$ in. thick, and beveled on one edge at the proper clearance angle for the gravers, was bored out to fit over

the nose of the chuck, to which it is held by a small thumbscrew, the chuck being first turned down parallel at the place where the guide fits. A zero line was scribed on the nose of the chuck, and the face of the guide graduated in degrees, as indicated.

In use, it is unnecessary to remove the graver from its handle, the tool being inserted through the hole in the center of the one-time tap wrench. The angle of the side faces of the cutting edge can be varied by loosening the thumbscrew on the guide and changing the position of the chuck with reference to the graduations on the block.—Charles E. Stark, North Attleboro, Mass.

Accurate Holes for Hinge Screws

In fastening a hinge to a door, or box, it is first necessary to drill small holes in the wood for the screws. The hinge is placed in the proper position and held there while one hole is marked off with a pencil. The hinge is then removed and the hole drilled, after which the hinge is replaced and a screw driven to hold it in place while the remaining holes are drilled, using the hinge as a template. In order to make this work a little more accurate, the device shown in the drawing was designed. It consists of an ordinary square-shank gimlet, or drill, of the proper diameter, with a spring sleeve on the outside. The sleeve is beveled at the lower end to the same angle as the countersink in the screwholes. Between the drill shank and sleeve, a spiral spring is placed; the pressure of this spring keeps the sleeve always in contact with the work so that the drilled hole is accurately centered.—Charles Homewood, Ontario, Calif.

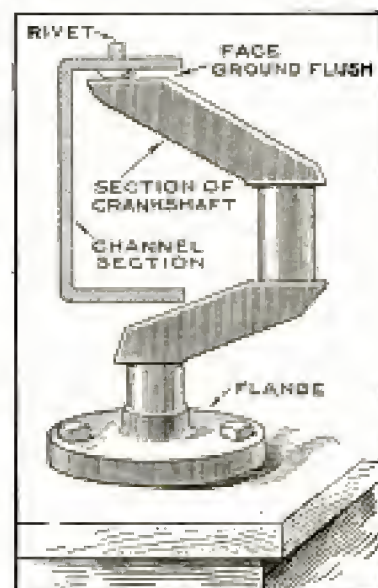


ⒸAn open flame should never be used for the purpose of discovering leaks in acetylene tanks. Leaks can generally be detected by the odor of the gas, and their location can be determined by applying soapy water to the surface of the tank, and watching for the bubbles formed by the escaping gas.

A Handy Riveting Anvil

Many riveting jobs require the work to be placed on an offset, to accommodate parts of the work while the rivets are being set, and this is particularly the case on channel iron and work of similar section.

An old automobile crankshaft can be utilized to make a very convenient anvil of this character, as indicated in the drawing, with very little trouble. The shaft is cut off between two crankpins and the cut face ground, or otherwise smoothed off, to provide a plane surface. The section is bolted to a suitable support by means of screws, or bolts, through the flywheel flange. An anvil of this type will prove a useful fixture in the garage for such work as relining brakes, repairing lamp casings, and other work where an opening under the face of the anvil is required.



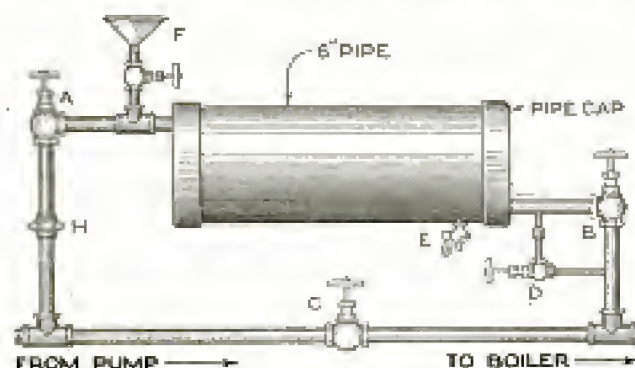
Rubber Trough for Acid Carboys

Acid carboys are bulky and difficult to handle unless they are mounted on some form of pouring device. If no device of this character is available, it is a very difficult matter to pour acid without more or less splashing and spilling, with resulting damage to clothing and surrounding objects. By using a suitable length of automobile inner tube as a trough to guide the acid, all the potential loss and damage can be prevented. A hole is cut into one end of the tube section to fit over the neck of the carboy, and the upper wall is cut away as shown, leaving the sides to guide the fluid into the receiving container.



Boiler-Compound Feeder

The steam boiler-compound feeder illustrated has features not possessed by the usual arrangement. A piece of large-



An Arrangement for Feeding Boiler-Compound Solutions into Steam Boilers with the Feed Water: The Supply of Compound can be Forced in as Fast or Slow as Desired by Proper Manipulation of the Valves

diameter pipe, closed at the ends with caps or flanges, is used as a receptacle for the solution. By opening the valves A and B and closing C, the pump discharge will be forced into the boiler, carrying the compound solution along with it. By leaving A and C open, B closed, and the $\frac{1}{8}$ -in. valve D slightly open, a slow feed of compound will be secured. It is nearly impossible to get a slow feed by leaving the valves A and B slightly opened. The tank can be emptied of water through the draincock E and filled with the compound through the valve F, the upper end of which is fitted with a funnel. Some engineers may prefer to have the union H located between the tank and valve B; a small union or right and left-hand coupling is used to connect the $\frac{1}{8}$ -in. pipes. The addition of a glass indicator on the tank, while not necessary, would be an improvement.

Hardened Hasp Staple Prevents Sawing

The staple of an ordinary padlock hasp is made of soft steel or iron, and it is usually an easy matter to saw it off and release the hasp; less trouble than to pry off the hasp or saw the lock. A way to prevent this is to make a special staple of drill rod, hardened and tempered, or of casehardened soft steel. If one is unfamiliar with casehardening, the use of drill rod is preferable, as this need only to be heated, quenched, and the temper drawn. The length of rod, which should be of the largest diameter that will pass through the slot in the hasp, is annealed, and each end is threaded. Old dies should be used if possible, as drill rod is hard on new

ones; the S. A. E. thread, as used by automobile repairmen, is preferable to the U. S. S., as less metal is removed.

Then the rod is bent to form the staple, heated bright red, and plunged into water. After testing for hardness with an old file, the piece is brightened up with emery cloth and again heated until the polished surface turns to a deep blue, when it is again plunged into water. If tempered correctly, the staple will be too hard to saw easily, but not hard enough to be brittle. After pushing the arms through the staple plate, nuts are screwed onto the ends and these are sunk into the wood beneath the plate.

Eyelets in Draftsman's Triangle

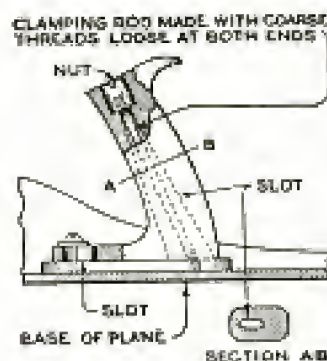
The draftsman's triangle can be arranged so that it is raised out of contact with the paper at each corner, thereby lessening the chance of blurred lines. A hole is drilled through the triangle at each corner; shoe eyelets, which can be obtained from any shoe repairer, are inserted in the holes, and heads are formed upon them. The short legs will keep the instrument from contact with the paper, but do not interfere in any way with its regular use.—C. B. Smith, Chicago, Ill.

Plane Handle Made Adjustable

The plane handle illustrated is made so that it can be pushed toward the adjusting nut to meet the requirements of different users. Ordinarily, the position of the handle with relation to the adjust-

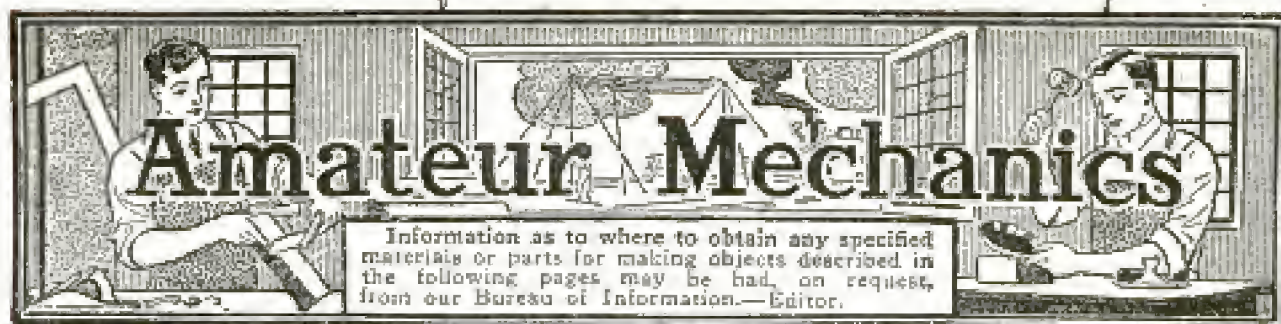
ing nut is such that it can be conveniently reached by only a few persons.

A tapered slot is cut into the handle, as indicated in the drawing. The clamping rod is made with a coarse thread at each end, and



makes a loose fit in the nut and bottom of the plane. This makes possible an adjustment of the handle forward for the particular convenience of short-fingered users, or backward for the user whose fingers are long. The adjustment is made by loosening the nut, moving the handle the required distance in either direction, and retightening the nut.—M. E. Duggan, Kenosha, Wis.

material from electrical supply house



How to Make an Electric Hair Drier

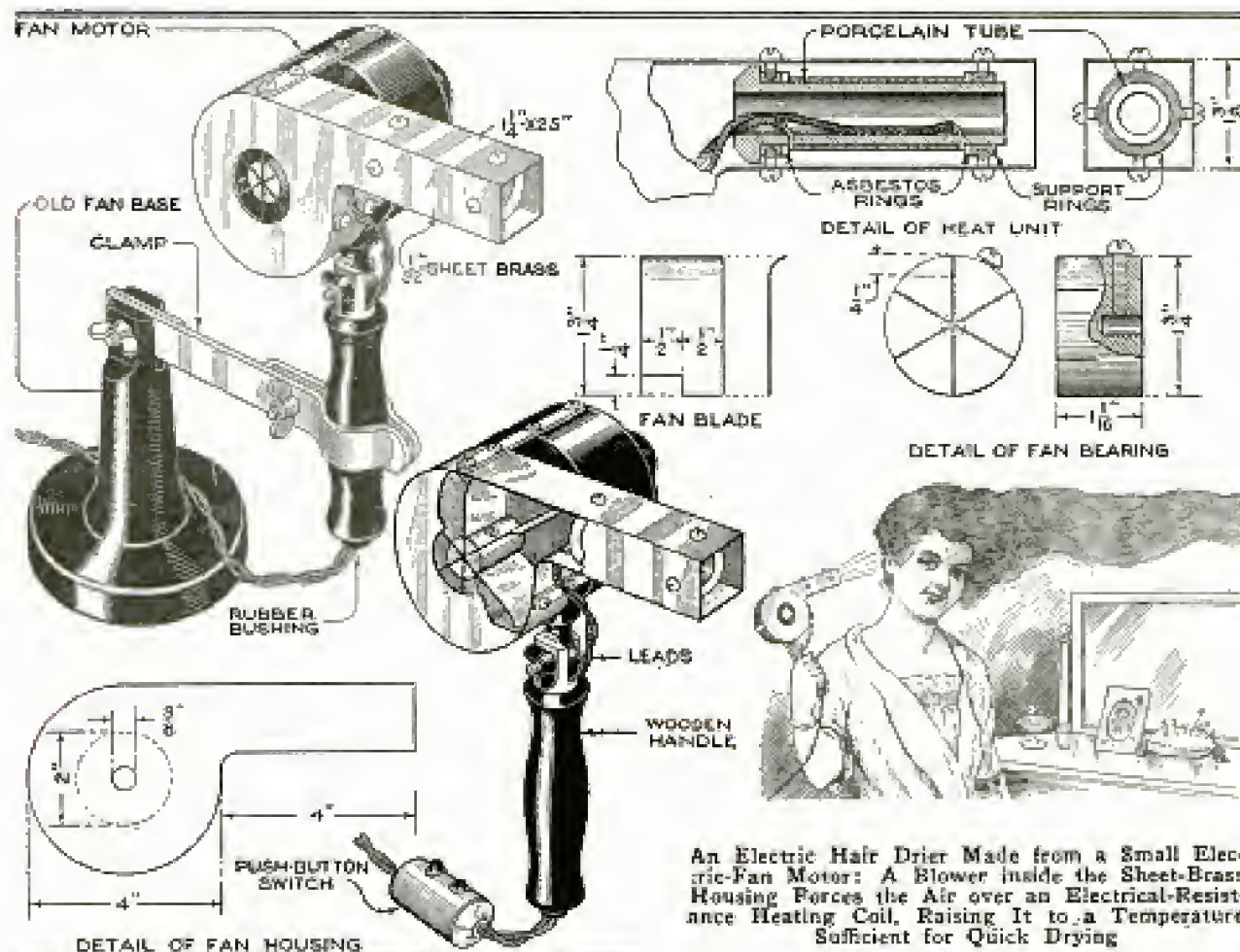
By A. H. SCOTT

THE only parts of the electric hair drier illustrated that require to be made, are the blower and heating unit over which the air is driven to raise it to a temperature high enough for speedy drying.

Two pieces of sheet brass, as illustrated, will be required for the sides of the fan housing, as well as a strip of the same

half their width, as shown, are sufficiently rigid to stand without additional support. The combination blower and heater is held to the electric motor by strips, screwed to the blower and to the motor shell.

To make the heating unit, obtain a porcelain insulating tube such as used in ordinary house wiring, with an out-



material to form the top and bottom. The fan hub, or bearing, is made from a piece of round brass or iron, slotted across one end to accommodate the six brass blades. The blades are soldered into the slots, and, although supported for only

side diameter of 1 in. This tube is cut off $3\frac{1}{2}$ in. from the shoulder end, and used as a core for 32 turns of .025-in. German-silver resistance wire. Wind the wire tightly so that there will be a space of $\frac{1}{2}$ to $\frac{1}{4}$ in. between turns, to prevent

short-circuiting. The ends of the first and last turns should be passed through $\frac{1}{8}$ -in. holes drilled through the tube. When drilling the tube, it should be plugged with wood and held in a vise, the jaws of which are protected with wood; an ordinary twist drill is used. The leads connecting the heating unit to the circuit must be asbestos-covered.

The heating unit should be centered out of contact with the blower housing. This is done with two brass rings, one at each end of the tube, cut from 1-in. brass pipe.

These rings should fit snugly over the ends of the porcelain tube and be insulated from the winding by asbestos washers. The rings are tapped at opposite sides to receive four machine screws.

When assembling the blower, care should be taken to avoid projecting screws that would catch the blades. The finished drier can be provided with a wooden handle, and this can be clamped to an iron base in the manner illustrated, so that it can be used either in the hand or upon a table.

A Japanese Table Lamp

The photograph shows a handsome Japanese-style table lamp, the principal parts of which, with the exception of the



A Neat and Attractive Table Lamp Made in Oriental Style: The Principal Parts are Made of Sheet Metal

base, are made of sheet metal. The panels in the lamp shade are painted, in Oriental style, on opal glass, using transparent colors. The entire frame is painted and covered with sand while the paint is still wet, and the edges are touched up lightly with gold. The shade is wired for an electric lamp, the wires being conducted through the tubular supports and underneath the base; this is made of wood, and is supported above the table on short feet. The completed work can be decorated with small bells and tassels, as in the picture, to increase the Oriental effect.

—Louis Beegle, Los Angeles, Calif.

620 S Broadway
An Advertising Novelty

A novelty in window advertising, that will draw crowds, is very cheaply and easily made from a toy balloon.

The balloon, partly inflated, is fastened over an electric-light bulb in such a manner that air cannot escape at the point of

connection. A make-and-break socket, or some other means of opening and closing the circuit intermittently, is provided. When the current is turned on, the light transmitted through the thin rubber balloon will attract attention, and the heat from the bulb will cause the confined air to expand and distend the balloon. As soon as the circuit is opened and the light goes off, the air inside the sphere begins to contract and the balloon grows smaller. An advertising message can be painted on the balloon if desired.—Frederick C. Davis, St. Joseph, Mo.

Yoke Prevents Turkey from Straying

An Ohio farmer, whose turkey hen was continually wandering off with the young poults, devised the board yoke shown in the picture, which keeps the fowl from flying over or crawling through wire fences.

A board, about 6 in. wide and 18 in. long, of the lightest wood obtainable, was tied over the turkey's shoulders, an opening being cut in one edge of the board to conform to the outline of the back. The yoke was fastened to the bird by cords passing under the wings and across the breast.—C. M. Baker, Wooster, Ohio.



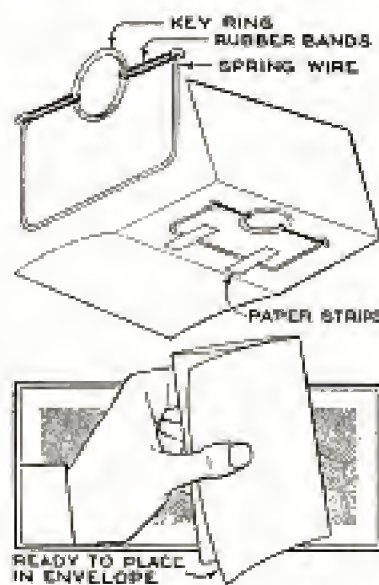
■ A section of old inner tube, with one end cemented shut, makes a handy water pail for the motorist.

Antirattler for Windows

The flat-steel hair curlers that have taken the place of the familiar curling papers can be used to prevent a window from rattling. The curler is flattened out at the point where it is bent, and the resulting spring wedge is inserted between the window sash and frame.—Frank Jablceknik, Chicago, Ill.

A Trick "Letter"

Endless amusement will be obtained from the simple device illustrated, which



is attached to an ordinary sheet of letter paper, folded up and placed in an envelope. On opening the supposed "letter," the recipient gets something of a surprise when the ring revolves rapidly.

A U-shaped piece of spring wire is fastened to the paper by paper strips.

An iron washer, or ring of the type shown, is held across the open part of the "U" by rubber bands. In use, the rubber bands are twisted so that as soon as the letter is opened they begin to untwist and the ring to revolve, causing it to whiz and whirl as though there were something very much alive in the letter.

Using Broken Drain Tile

An outdoor stove can be made from a section of tile, for use in cooking feed, heating water, melting tar, and similar operations. A sheet-iron top, with a hole cut in it to accommodate a length of stovepipe, is provided to support the vessels. An opening in the form of an inverted "U" is chipped in the tile, at a point near the bottom edge, for the insertion of fuel.

The breakage of a small section from the flange of large-diameter sewer tiles makes them unsuitable for use in drainage systems, and they can easily be obtained by anyone wishing to use them.

Exhaust Cleans Down Spout

It happens frequently that birds' nests, leaves, and other debris collect in the eaves troughs and wash down into the conductor pipe. During a heavy rain the pipe may be so thoroughly clogged that a free flow of water to the cistern or drain is impossible.

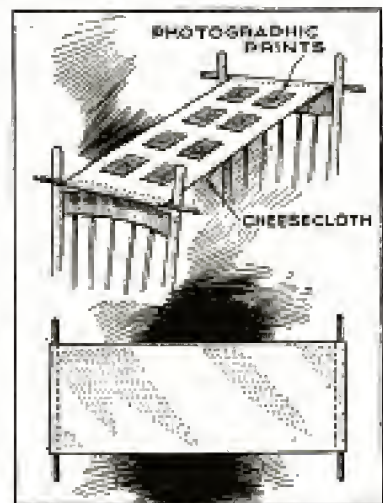
As such obstructions are generally not accessible without a great deal of difficulty, the exhaust from an automobile engine can be used, with good results, to blow out the accumulated debris. The drawing shows how this is accomplished by connecting the rain spout to the exhaust pipe of the car with a piece of hose. By racing the engine, there will be sufficient pressure to eject all ordinary obstructions through the eaves-trough opening.—G. E. Hendrickson, Argyle, Wis.



A Print-Drying Stretcher

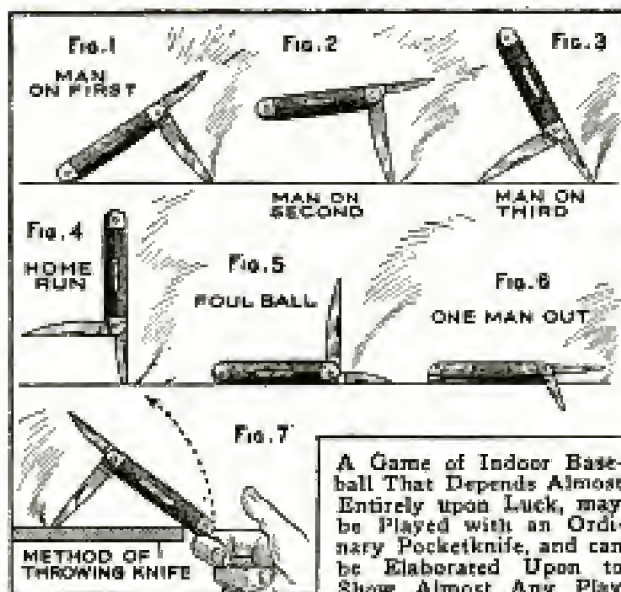
The commonest method of drying prints consists in the use of a cloth-covered

stretcher on which the prints are placed face downward; as cheesecloth is used, there is more or less circulation of air on both sides of the print, which consequently dries very quickly and without the tendency to curl. As generally built, wooden frames are made and covered with cheesecloth, but these occupy considerable room. However, if a strip of cloth, of the length desired, is hemmed at the ends and pieces of broom handle inserted, as indicated in the drawing, the stretcher can be supported between two chairs, and rolled up into a compact bundle when not in use.—Harry G. Schultz, Teaneck, N. J.



Indoor Baseball with a Penknife

A game of indoor baseball that depends for results more on pure luck than on skill, can be played with an ordinary



pocketknife having two blades that can be opened at right angles to each other.

The game is played on a board, or on an old table. Fig. 1 shows the position of the knife that gives the player a man on first base; when the handle is not touching the surface, as in Fig. 2, the player is on second, while to have a man on third, the weight of the knife must be resting on both blades, as in Fig. 3. A home run is scored for the player when the knife stands vertically as in Fig. 4, and the positions of the knife for a foul and a man out are shown in Figs. 6 and 7.

In playing the game, the knife is rested on the surface of the table in the manner shown in Fig. 7 and given a quick upward flip with the hand. Various other plays may be improvised with little trouble by the baseball devotee, so that the game can be made really elaborate.—W. S. Morton, Pasadena, Calif.

Incubator Used as Oats Sprouter

The value of sprouted oats as a green food for poultry has long been recognized, but the difficulty of obtaining or constructing an efficient sprouter has prevented many spare-time poultrymen from making use of the knowledge.

Any poultryman who owns an incubator that is not working during the winter months has at his command an efficient device for sprouting oats. The drawers are removed and extra strips are temporarily tacked to the sides of the

incubator, on which the trays containing the oats are placed. The trays are single wooden frames covered on one side with screen wire or burlap. About an inch of space is allowed between each tray to permit a free circulation of warm air.

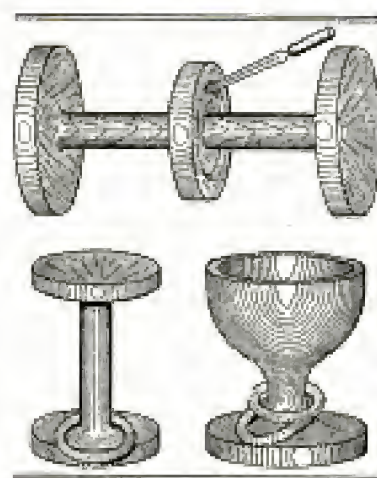
The oats are moistened and placed in the trays and the incubator lamp is lighted and adjusted to maintain a temperature of about 75° F. To prevent the oats from drying out, pans of water should be placed on the floor of the incubator and the grain sprinkled each day.

If the various trays are filled at intervals of a day or so, the poultryman will have a constant supply of green food for his flock.

In placing the additional strips that are necessary for supporting the trays, very small brads or nails should be used, as there will be very little weight upon the strips, and their removal will not then be so likely to mar the appearance of the incubator.

Novelty Wood Turning

Specimens of wood turning containing rings that cannot be removed because they are smaller than the ends of the article to which they are attached, are turned out quite easily on the wood-turning



ing lathe, the illustrations showing two examples of this class of work.

The first operation is to turn the work to the desired shape, as shown, leaving a disk on the spindle. Next, sand and polish the disk as

though it were to remain there, and when this is done the ring can be cut from the disk in the manner illustrated. This is best done with a sharp-pointed tool, held at about the angle indicated in the drawing, cutting very slowly. When the ring is loose, the lathe must be stopped and the inner side smoothed with a file. The ring can be tied to the spindle where it will be out of the way, and one or more smaller rings can be turned off in the same manner, if so desired, or the remainder of the disk turned off flush with the spindle.—Victor Carl, Steubenville, Ohio.



UTILIZING NEW STEEL TRENCH HELMETS

Fruit Dish, Poultry Nest, and Umbrella Stand Made from Helmets

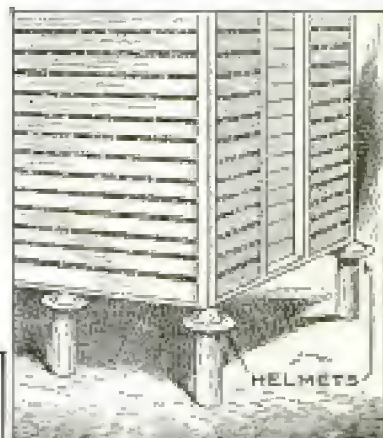
The three ideas illustrated in the large drawing, the fruit dish, poultry nest, and umbrella stand, were submitted by J. V. Romig, of Allentown, Pa.

The fruit dish is supported on feet, about 1½ in. long, turned from brass rod. These feet are inserted into holes drilled through the helmet, and riveted, the finished article being decorated in any desired manner, and then lacquered.

Parasites that infest wooden nest boxes refuse to have anything to do with metal nests. Consequently, by mounting trench helmets in the manner shown, the general condition of the flock will be improved. The steel nests are indestructible, and, having no corners or crevices, easily cleaned.

A trench helmet will make an admirable drip bowl for an umbrella stand. The frame is made from ½-in. pipe and fittings, of polished brass, nicked brass, copper, or painted iron. Holes are drilled in the rim of the hel-

met to slip over the pipe standards, where it is held in place with cotter pins. The small hole in the center of the crown may be plugged, so that, by removing the plug, water from the dripping umbrellas can be



Rats Kept Out of Cornerib by Helmets Nailed on the Posts

drained off without removing the helmet.

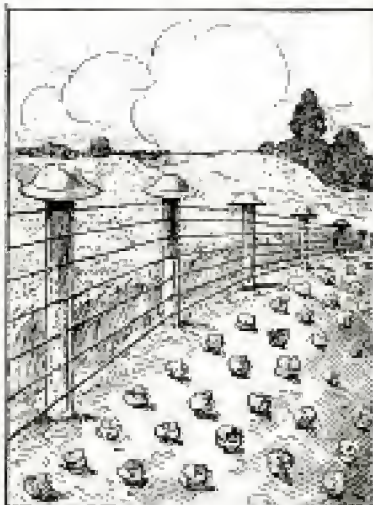
Helmets Keep Rats Out of Cornerib

Truman R. Hart, of Ashtabula, Ohio, who won the third prize of the contest with his idea of utilizing helmets for bird baths, also contributed another plan that makes use of them

for keeping rodents and other vermin out of corneribs and similar elevated storage bins. The idea involves nothing more complicated than capping each of the supporting posts with a trench helmet that has been drilled with two or three holes so that spikes can be driven through the plate into the post.

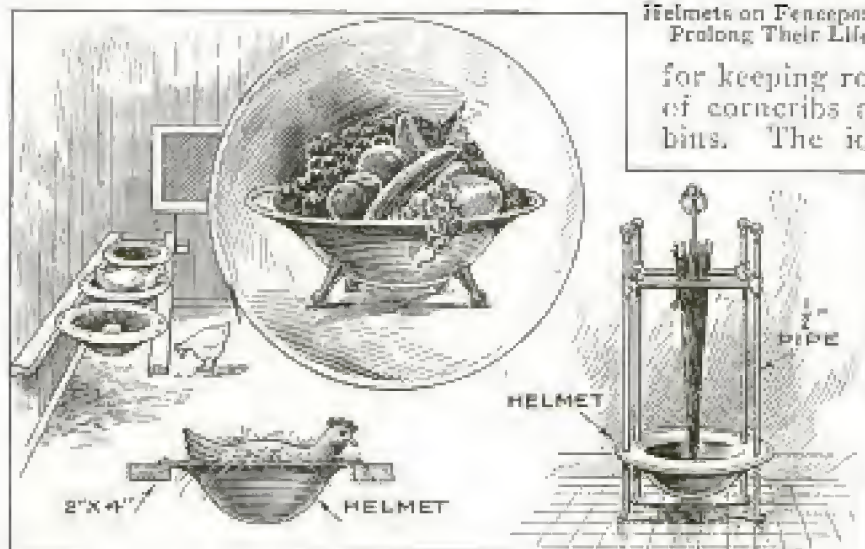
Fenceposts Preserved by Helmets

From saving the lives of soldiers on the battlefield, the trench helmets have been adapted by R. C. Leibe, of Chase



Helmets on Fenceposts Prolong Their Life

for keeping rodents and other vermin out of corneribs and similar elevated storage bins. The idea involves nothing more complicated than capping each of the supporting posts with a trench helmet that has been drilled with two or three holes so that spikes can be driven through the plate into the post.

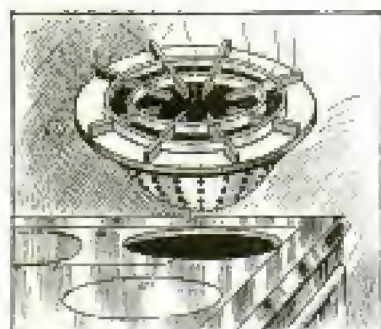


At the Left, the Helmets are Shown in Use as Sanitary Nests; in the Center, as an Attractive Fruit Dish; and at the Right, as a Drip Bowl for an Umbrella Stand

City, Va., to prolonging the life and usefulness of fenceposts on the farm. The drawing shows how each post is surmounted by a helmet that is held in place with a long spike. Naturally, this protection prevents water, that would cause the post to check and split within a comparatively short number of seasons, from coming into contact with the exposed end.

Trench Helmet as Charcoal Brazier

A rather original idea in which a trench helmet is used as a charcoal brazier in the kitchen stove during the heat of summer, is the contribution of Roland B. Cutler, of Springfield, Vt. The crown of the helmet is perforated with $\frac{1}{4}$ -in. holes to permit circulation of air through the burning charcoal that is placed inside. In use, the helmet is set into one of the openings of the kitchen stove, and a grid from an oil or gas stove, resting upon a plate fastened to the rim, completes the arrangement.

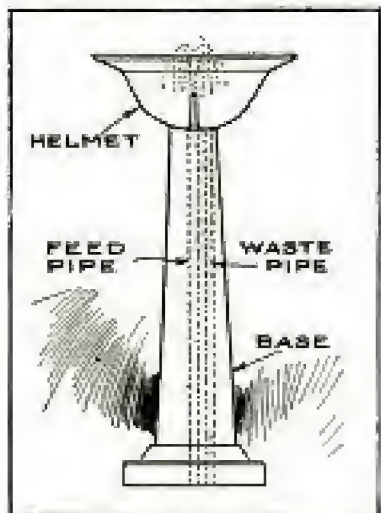


This Brazier will be Found Very Effective during the Summer

tion of air through the burning charcoal that is placed inside. In use, the helmet is set into one of the openings of the kitchen stove, and a grid from an oil or gas stove, resting upon a plate fastened to the rim, completes the arrangement.

A Helmet Drinking Fountain

From New Hartford, N. Y., Floyd A. Krenzer submitted his idea for making a sanitary drinking fountain, using the trench helmet as a receptacle for catching the waste water. The water-supply pipe, with a suitable nozzle at its upper end, comes through the center of the crown, while the overflow is carried off by a waste pipe



A Helmet Makes an Effective Drinking Fountain

that is arranged a little to one side of the center. The fountain is mounted on a pedestal, that can be made to correspond with its surroundings; in some instances, it might be found preferable to mount it on wall brackets.

Helmet for Stovepipe Cap

To prevent rain from blowing down a stovepipe chimney and causing it to rust to pieces rapidly, Anthony Jacobucci, Philadelphia, Pa., suggests that the army trench helmet be used as stovepipe caps in the manner shown in the drawing. A strip of flat, stiff iron is riveted around the stovepipe as a reinforcement for helmet-supporting braces, which are riveted to it and the helmet. Not only does a cap of this kind prevent entrance of rain, but, as the helmet is somewhat larger in diameter than the stovepipe, there is slight possibility of a down draft blowing the smoke out into the room below.



A Helmet Cap on the Stovepipe Prevents Rust and Down Draft

A Neat Sewing Stand

Arthur Gulbranson, of Chicago, Ill., has fashioned from a trench helmet a very substantial addition to the sewing equipment of the feminine portion of his family. As the photograph shows, feet of $\frac{1}{8}$ by 1-in. annealed brass strips, are riveted or soldered to the crown of the helmet. A combined spool rack and scissors holder, of the same material, is soldered in place, $\frac{3}{8}$ by $\frac{7}{8}$ -in. brass pins being soldered to the crossbar to hold the spools. This crossbar has small projecting ears passed through slots in the side-pieces, soldered in place, then scraped bright. A clip and socket for the scissors are also soldered to one of the side-pieces, and a small brass pin, soldered to the top of the rack, makes a convenient holder for a thimble. The helmet and fittings were rubbed to a high polish with fine emery cloth and then lacquered, completing a very useful and substantial piece of work.

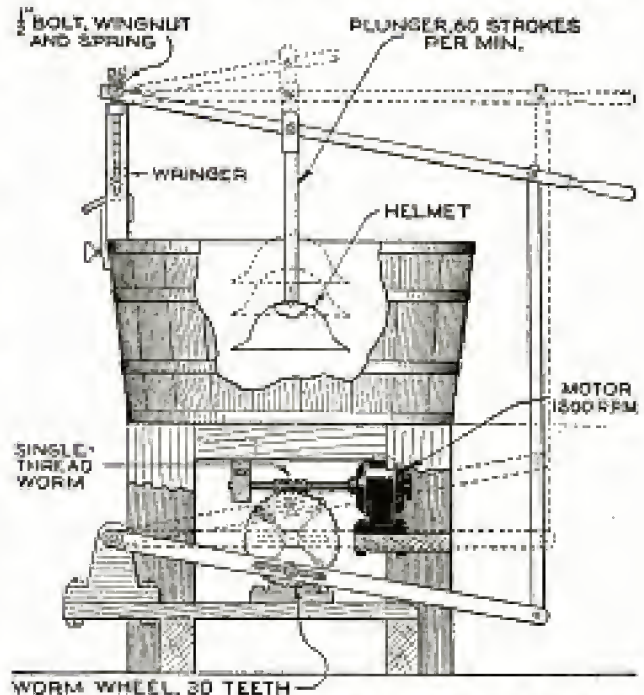


A Substantial and Attractive Helmet Sewing Stand

Trench-Helmet Washing Machine

A washing machine that can be operated by hand, or driven by electric motor, is the plan of Edwin J. Bachman, of Fullerton, Pa. He already has the hand-power machine in successful operation but plans to "motorize" it, so that it will be driven by a $\frac{1}{4}$ -hp. electric motor. The hand-power machine is simplicity itself and consists of nothing more than a lever to which the trench-helmet vacuum plunger is attached. The hand lever is fastened to the top of the wringer by means of a bolt, wingnut, and spring, while the plunger with the trench helmet attached to its lower end swings freely on the hand lever, so that the former is always in a perpendicular position. If electric current and a $\frac{1}{4}$ -hp. electric motor are available, it requires but little additional effort to make the motor do the work by following the arrangement shown in the drawing, the most important part of which is the gear and lever arrangement for reducing the speed of the motor and transmitting the motion to the helmet. The lower lever is slotted to fit over a crankpin in the larger gear; the center of the worm wheel must be directly below the center of the helmet, and the pivots on the slotted lever directly in line with those on the hand lever. Then, with the pin in the worm wheel 2 in. off center, the

stroke of the plunger will be 4 in. It will be observed that with such an arrangement there will be more or less swinging



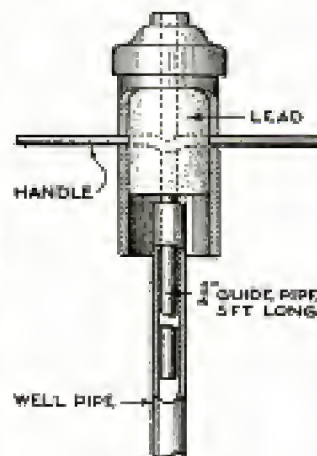
A Helmet Used as a Vacuum Plunger for a Washing Machine: The Drive Shown Is Only a Suggestion, and may be Modified in Any Desirable Way

of the plunger, whether operated by hand or power, but this is desirable because it permits the plunger to come down at a different point in the tub at almost every stroke.

Driving Well Pipes

Where water at slight depths below the surface is found suitable for household purposes, the most practical and inexpensive method of sinking a well consists in driving a screened drive point into the earth. After boring a few feet below the surface, place the pipe, with the point attached to the lower end, in the hole, and drive it down until the flow of water is reached.

In order to drive the point to the desired depth, much care is needed to avoid injuring the pipe threads. To make the work simple, and a one-man job, the hammer shown in the drawing can be used with excellent effect.



The $3\frac{1}{2}$ -in. diameter brass shell of an old pump cylinder was obtained, although a similar piece of pipe with a cap over one end will answer as well. Holes were drilled through opposite sides, large enough for a piece of $\frac{3}{4}$ -in. iron rod to serve as a handle. A piece of $\frac{3}{4}$ -in. pipe, about 5 ft. long, was screwed into the cap on the end of the pump cylinder, as in the drawing. The hammer was weighted by filling the interior with 12 lb. of melted lead. In use, the pipe guide is inserted inside the well pipe, and the hammer is lifted and allowed to drop, forcing the point deeper into the earth at each stroke.

—Geo. G. McVicker, North Bend, Neb.

Typing to the Bottom of Sheets

When typewriting on postcards and envelopes, one often has occasion to write to the very bottom, but finds this impossible because the work slips out from under the feed roller. This trouble can be overcome, in most instances, by attaching the upper edge of the work to a somewhat larger sheet, with paper clips.

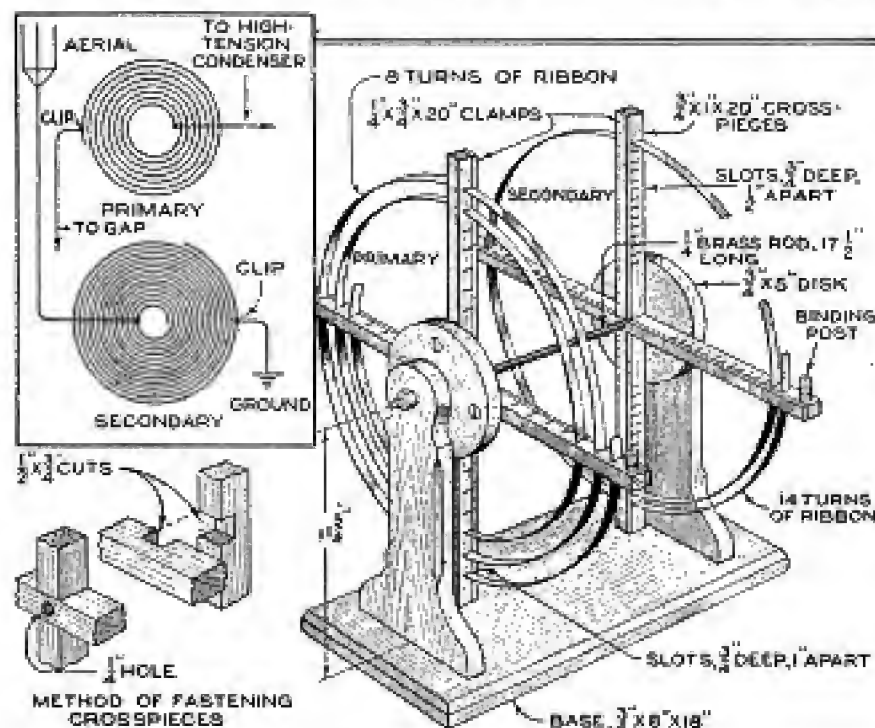
An Oscillation Transformer

The oscillation transformer is an important part of an efficient radio-trans-

without undue heating at the gap, as experienced with the old-style helix. The pancake transformer has made possible some remarkable records in amateur stations and nearly all of the record holders use it.

The woodwork may be any variety of wood, stained and finished to the satisfaction of the maker; poplar or birch will be found easy to work, and will take a mahogany finish well. The base and uprights are cut to the dimensions given, and assembled with $1\frac{1}{4}$ -in. wood screws, driven through the bottom of the base. The brass rod is threaded and provided with a washer and nut at each end. Two wooden disks are screwed to the back of both primary and secondary crosspieces with 1-in. screws, and the crosspieces are slotted to take the required number of turns of ribbon.

This ribbon may be of either copper or brass, about $\frac{1}{16}$ in. thick by $\frac{3}{4}$ in. wide; it may be made up from a number of short pieces soldered together, or bought in one length, from any dealer in radio supplies. Clamps, in the form of light wooden strips, for holding the turns in place are fastened over the slots, so that there is no possibility of the ribbon working out of position. A binding post may be used at each outside ribbon terminal if desired, the lead wires to the condenser and aerial being soldered to standard helix clips, or clips can be used at all points. The clips from an old knife switch make ideal contacts.—F. L. Brittin, Chicago, Ill.



A Simple and Easily Made Oscillation Transformer, of the So-Called "Pancake" Type: All Material, with the Exception of the Ribbon, can be Picked Up around the Radio Laboratory

mitting set, and there are many types on the market; the best kind, for all practical purposes, however, is the so-called "pancake" type. This transformer is simple to make and inexpensive. The advantages of this type of transformer over the helix type are many, as it permits either direct or inductive coupling, insures a pure and sustained wave that can be sharply tuned at the receiving station, and cuts out interference. All parts of the winding are accessible to the clips, the primary and secondary slide along a horizontal brass rod that makes quick changes in coupling possible, and the full energy of the transmitter can be utilized

either copper or brass, about $\frac{1}{16}$ in. thick by $\frac{3}{4}$ in. wide; it may be made up from a number of short pieces soldered together, or bought in one length, from any dealer in radio supplies. Clamps, in the form of light wooden strips, for holding the turns in place are fastened over the slots, so that there is no possibility of the ribbon working out of position. A binding post may be used at each outside ribbon terminal if desired, the lead wires to the condenser and aerial being soldered to standard helix clips, or clips can be used at all points. The clips from an old knife switch make ideal contacts.—F. L. Brittin, Chicago, Ill.

Using Old Engine Valves

Gas-engine valves, with bent stems or warped heads, can frequently be salvaged from the scrap pile and put to further use for other purposes. Recently, in placing a concrete garage floor, the metal channel in which the doors slid was bolted down by imbedding a number of old valves in the plastic concrete, head down; of course, lining them up with the holes in the channel and threading the stems. These served as efficient anchors, as the

mushroom-shaped heads caught a firm hold in the cement. As a tube-patching fixture, a motorist inserts the stem of an old valve into a hole in his workbench. The tube to be patched is placed over the convex head of the valve, and the patch is made in the usual manner. In another instance, a similar valve was converted into a tail-lamp bracket by bending and threading the stem and drilling holes through the head so that the fixture could be bolted to the car; the head, in this case, was ground flat.

Waterproofing Rope Clotheslines

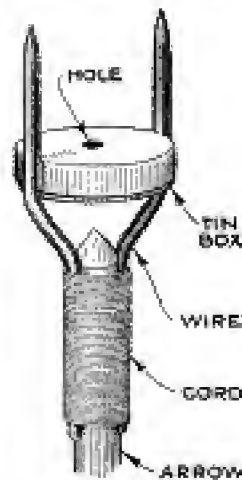
In order to make a rope clothesline waterproof and resistant to atmospheric influences, treat it in the following manner: Make two separate solutions, the first consisting of 1 lb. of soap dissolved in 5 qt. of water; the second is made by dissolving 1 lb. of ordinary alum in the same quantity of water. The soap solution is heated to about 120° F., and the rope immersed in it until the fibers have been thoroughly soaked; it is then removed, wiped free of superfluous solution, and transferred to the alum bath, in which it is allowed to remain for about 30 minutes, then taken out, and the excess solution wiped off.

This process impregnates the fibers of the rope with a soap that is insoluble in cold water, making it quite waterproof.

A Whistling Arrow

An arrow that will give a sharp and piercing whistle, when shot into the air, the tone rising and falling with the speed of the missile, is made as shown in the drawing. Two stout-wire prongs are bent as indicated and tightly bound to the shaft, the distance between the points being about 1 in. A small round tin box, of corresponding diameter, is obtained, and a hole, about $\frac{1}{8}$ in. in diameter, is drilled through the center, care being taken to remove any burrs or rough edges

that might be around the holes. The box is placed between the prongs, to which it is held by soldering.—A. R. Mutton, Waterloo, Ia.



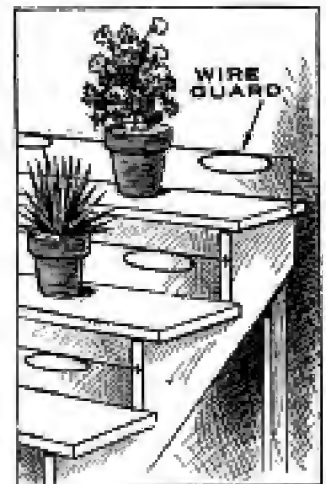
Hanging Pictures Straight

When framed pictures are always getting crooked, the appearance is far from pleasing, and the effect is annoying. To overcome this "shiftiness" of pictures, first hang the picture with its face to the wall. Adjust it so that it is hanging perfectly straight and then turn it around. The single twist in the cord or wire is usually sufficient to prevent it from slipping on the nail or hook from which it is suspended.

Guard for Flowerpot Stand

When flower stands that support potted plants are exposed to sudden gusts of wind, the plants are often blown from the shelves, with consequent damage to the plants and pots, and, also, in some cases, to the surroundings.

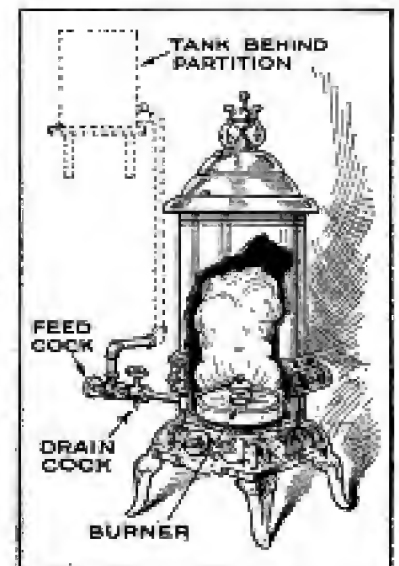
The drawing shows a neat and safe method of preventing the plants from being easily displaced. A piece of stiff iron wire has a number of loops formed in it, the ends being attached to the stand at such a height that the loops will fit the pots just underneath the shoulder.—Truman R. Hart, Ashtabula, Ohio.



An Oil-Burning Coal Stove

A resident of the Pacific coast, having on hand a kerosene burner and fuel tank, changed his wood and coal heating stove into an efficient oil-burning heater with but little trouble or cost. A burner, which was of the vapor type, with a disk above the flame, to deflect it horizontally, was set on the stove grate. A hole was then drilled through the side of the stove to admit the fuel-supply pipe. As the heater was used in the dining room,

the feed pipe was passed through the partition into the kitchen and connected to the tank, which was supported on a shelf, as indicated in the drawing. A "gooseneck," made in the stovepipe by the use of four elbows and short lengths of pipe, permitted the escape of odors while reducing the waste of heat ascending the chimney.—Edwin M. Love, Alhambra, Calif.



809 N. Stoneman Ave



Part II—Spars, Rigging, and Assembling

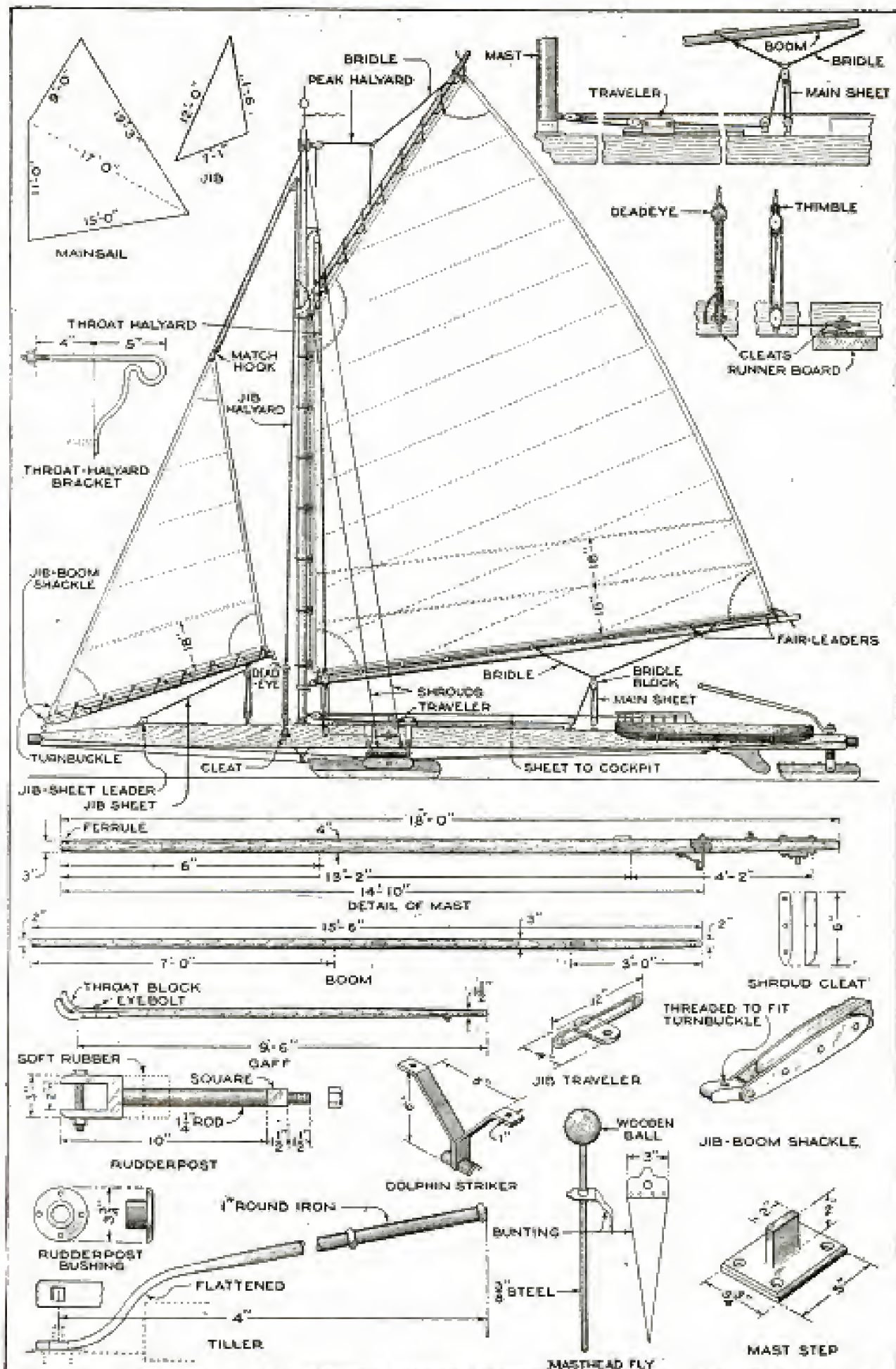
ONLY the best grade of spruce is suitable for spars. Unquestionably hollow ones are lighter and stronger, but they cost a lot more. If expense is no objection, buy hollow spars, otherwise proceed as follows: For the mast select the clearest 4 by 4-in. stick to be found; for the boom and gaff a 3 by 3-in. stick, and for the jib boom, a 2 by 2-in. piece. Plane the stick for the mast fairly smooth on all four sides, then lay off a taper from a point 6 ft. from the foot, reducing the diameter to 3 in. at the heel. Plane all four sides, still keeping the stick square. From a point 5 ft. from the masthead, taper to 2½ in. Plane off all four corners, making an octagonal stick; then, with a small plane, round the spar, and finish with enough sandpaper and elbow grease—especially the elbow grease—to remove all plane marks. If any attempt is made to round the spar before tapering, it will be found impossible to keep it straight. A brass or iron ferrule, 2 in. wide, is fitted to the foot to prevent splitting, and a mortise cut to receive the mast step. Shroud cleats of apple wood or maple, of the form shown, are screwed at the points indicated, and the throat-halyard bracket and eyebolts put in place. The boom and gaff are identical in construction with the mast. The boom tapers to 2 in. at either end, with a large hole through the after end for the sail haul-out. The gaff tapers to 1½ in. at each end, with a haul-out hole at the peak, and oak jaws, fitted with a throat block, riveted at the throat. It is best to buy the jaws from a ship chandler. The jib boom is not tapered, but is rounded, and the jaws of the jib-boom shackle are riveted in place. The bridle cleats for the boom and gaff are similar to the shroud cleats, but smaller.

Wherever possible, brass or bronze should be used for fittings, although iron will do. The detail drawings show the masthead fly, throat-halyard bracket, and the two guy irons so plainly that no description is needed. The jib traveler is of ¾-in. rod, riveted and brazed to a ¼-in. plate. Ten-penny nails make excellent

cross pins for the traveler; the object of these is to prevent the sheet block from slipping around to the underside of the traveler. The two members of the mast step are also riveted and brazed. The dolphin striker is of ¼ by 1-in. stock, with a half section of pipe brazed in the lower end of the "V." The jib-boom shackle is all brass, with the end hole threaded to fit the forestay turnbuckle. The gammon-strap set cannot be made until the backbone and runner-plank parts are in place. It will probably be found advisable to cut strong paper patterns of the gammon straps for the blacksmith or machinist to work from. The bolts on the straps are riveted and brazed to the flat iron. Unless cast of bronze and turned, the rudderpost must be forged by a first-class blacksmith, it being a somewhat difficult piece of work. It is fitted with a soft-rubber bumper, which greatly relieves the shock of sailing over rough ice. Of course, the tiller must be fitted to the post so that there is no lost motion. The handle is wound with cotton cord, filled with shellac, and varnished. Plates may be used in place of the rudderpost bushings, but will soon wear, and will, in turn, wear a groove in the post, so that bronze or cast-iron bushings, of the form shown, are well worth the extra expense, as they will last forever.

As there are a number of first-class sailmakers who specialize on ice-yacht sails, one of them should be selected, and the sail plan sent to him when placing the order. Yacht twill will make strong, durable sails at a low price, but the better grades of sailcloth are more satisfactory. In giving the order, the fact that the sails are for an ice yacht should be mentioned, together with the following specifications: jib to have snap hooks for forestay, and be made to lace to the boom, or the foot will be cut as for a sailing yacht. Main-sail to have thimbles in pairs on hoist for mast-hoop lacing, and single thimbles on foot. Otherwise leave it to the sailmaker. He knows.

The cockpit cushions are made of good-quality ticking, covered with corduroy or



Details of Sails, Rigging, and Hull Fittings: In the Upper Right-Hand Corner Is a Detail Drawing of the Method of Rigging the Main Sheet; below This is Shown the Method of Fastening the Jib, Peak, and Throat Halyards to the Purchase Blocks

plush on the edges and one side only, and filled with upholsterer's moss, or the contents of a discarded hair mattress; $2\frac{1}{2}$ in. is sufficient thickness. In length, the covering should be 6 in. longer than the cockpit, as proper filling shortens the cushion considerably, and if made long, the finished cushions will fit tightly enough to stay in place. The buttons for tacking should be covered with the same material as the cushion.

The shrouds, forestay, and guys are made of $\frac{1}{4}$ -in. iron wire, and the bobstay of $\frac{3}{8}$ -in. wire. In making up each piece, the measurements must be taken from the boat itself to avoid mistakes. Loops to fit the masthead, and the ends of the backbone, are first spliced; then the opposite ends are spliced into $\frac{3}{8}$ -in. galvanized shackle-and-shackle pipe turnbuckles of the slot and cotter-pin pattern. (Never use any hook turnbuckles.) All turnbuckles should be fitted with wire-rope thimbles, and all loops and splices tightly served with hard cable-laid cotton cord about $\frac{1}{8}$ in. in diameter, filled with shellac, and varnished. The bobstay has an eye splice formed to fit the backbone nose; from there it runs down under the dolphin striker and aft to the anchor iron screwed to the bumper. The bridles for the boom and gaff are $\frac{1}{4}$ -in. wire, with loops finished as above. The halyards should be crucible cast steel, $\frac{3}{16}$ in. in diameter, finished as follows: The jib halyard is spliced in a pair of match hooks with wire-rope thimble for attaching to the jib, and the lower end spliced around a lignum-vitæ deadeye. The upper end of the peak halyard is spliced into a self-locking brass bridle fitted with a thimble, and the lower end around a thimble to receive the purchase block. The throat halyard has a thimble in each end, one for attaching to the eyebolt at the jaws of the gaff, and one for a purchase block at the lower end. The splices are finished in the same manner as for the shrouds and stays. All Manila rope is $\frac{3}{8}$ -in., spliced in, with free ends moused with sail thread. The main sheet proper is spliced into the becket of the bridle block at one end, and around a thimble at the other, for attaching to the main-sheet traveler by a screw shackle. This traveler is hauled along the track by a purchase attached to the foot of the mast, giving ample power to trim sail easily during a race, without luffing and losing speed. The remaining ropes are so plainly shown in the illustration as to require no further description.

The halyard blocks are of the type de-

signed for wire rope only, all others being any first-class make of bronze yacht block, with fittings suited to the work for which each block is used. Galvanized blocks will not do, nor should any have hook fittings.

Together with the rigging described above, eyebolts, mast hoops, gooseneck, cleats, lacing, and screw fair-lead-ers must be purchased from the ship chandler. The jib and mainsail lacing is $\frac{3}{16}$ -in. braided cotton, and the same material is used for the sail haul-outs. Fair-lead-ers are screwed into the top of the main boom, alternating with the thimbles on the foot of the sail, and through all is run a Manila stop, drawn very tight. Two fair-lead-ers are also used in the runner plank on each side of the backbone, for lashing the halyard-purchase ropes.

The whole boat, including the sails, but not the runners, should be set up complete outside the shop to prove that every part fits properly before putting it on the ice.

Always, when setting up, the gammon straps are first bolted tight, then the runner plank and backbone squared by measuring from the center of the rudder-post hole to a certain point on corresponding chocks at opposite ends of the plank, tightening the guys accordingly.

A combined sail and cockpit cover, preferably of waterproof duck and extending the full length of the boat, is necessary for protection from the elements. It should be made in one piece, with an opening to go around the mast, and have grommets along each edge for ties to bind it down tightly to the guys and bobstay. A horse set under the boom will hold the cover up, tent-fashion. Colors for a craft of this size should be 18 by 12 in. During snow, the runners should be removed, dried, greased, and carefully put away in their box.

In many things one finds that the pleasure of anticipation and preparation far exceeds the actuality; this, however, does not apply at all to ice-yachting. For while the construction of such a craft will give the builder many happy hours' employment, the sailing of it will prove the greatest imaginable joy after the tricks of the trade are mastered, and the only way properly to master them is racing with some old hand at the game. When that incurable disease, "ice-yachting fever," attacks one's blood, the only relief is ice-yachting. While the building hardly comes under the head of woman's work, the sailing surely may be termed woman's sport as much as is running a motor car.

Transferring Prints to Glass

It is sometimes desirable to transfer photographic prints to glass, or to some other solid substance that may or may not be transparent, to obtain some particular decorative effect.

The surface of the glass, or other substance, is first coated with a half-and-half mixture of turpentine and Canada balsam, or, if obtainable, dammar varnish. The glass is set aside until the varnish has become quite "tacky;" the time required for this will vary with the dryness of the atmosphere. The print to be transferred is soaked in water until limp, and the surplus water is removed by pressing it between sheets of lintless blotter. The print is then carefully laid on the prepared surface, another blotter being used to press it into place and also to prevent the possibility of water or air bubbles being confined underneath the paper. When this is completed, the whole work is set aside until it becomes thoroughly dry, which will require from one to two days.

The next operation is the removal of the paper backing, so that only the film containing the picture will be attached to the base. The paper is removed by wetting the fingers and rubbing it off in small rolls, and it will be found, after a little practice, that this is not at all difficult.

If developing-out paper is used, a little more work will be required, as the paper stock is heavier than that ordinarily used for printing-out papers. When the paper has all been removed, the appearance and transparency of the finished work are improved by an application of transparent varnish. The same process can be applied to the decoration of opaque surfaces. However, in the latter case, the picture will be reversed, as the print is applied to the surface face down.—A. C. Cole, Chicago, Ill.

Soap Dish as a Motor-Car Fitting

A nickelplated soap dish, a familiar fitting in every bathroom, can be made to serve another useful purpose when mounted on the dash of an automobile, in front of the driver. Such a receptacle makes a convenient place for carrying matches and similar small articles.

Storm Windows Made from Shutters

A snug-fitting and easily opened storm window can be made by replacing with



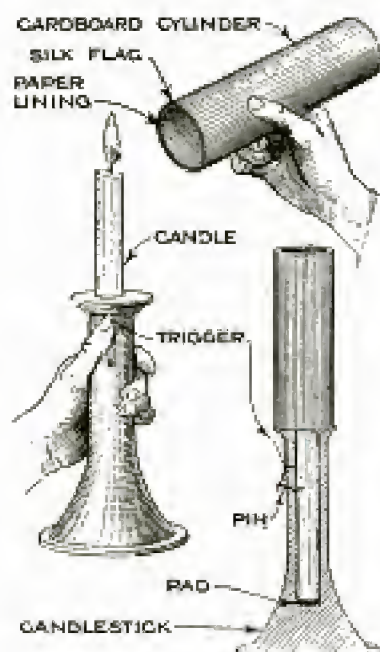
Outside Shutters Converted into Neat and Substantial Storm Windows by Merely Removing the Slats and Substituting Glass Panes! Even the Old Slats can be Used to Further Advantage for the Protection of Tender Plants, as Shown at the Left

glass the slats in the outside shutters of those rooms that are difficult to keep at a comfortable temperature in the winter. The slats can easily be removed and the glass panes that take their place are held by strips of light molding. The principal advantage of using the shutters as storm windows, aside from the ability to open them easily on mild days, is that they are already cut to fit and the hardware is already in place.

Even the old slats can be used to further advantage, as shown in one of the illustrations, by using them to support sheets of glass for the protection of early spring plants. Notches are cut into the slats at each end, and these serve to hold old photographic negatives in the manner illustrated in the lower photograph.—Walter C. Harris, Brooklyn, N. Y.

The Magic Candle and Flag

This is a trick that can easily be performed by the amateur with very mystifying effect, and the necessary apparatus is simple to make. The trick is this: A candlestick, with a candle in it, is placed on a table; a cylinder is shown to be empty, after which it is placed over the candle so that the latter is concealed; the "magician" makes a few appropriate passes, at the same time saying one of the seven magic words, of which "abracadabra" is the most "potent"; when the cylinder is removed, the candle will have disappeared, and the tube is still shown to be empty. Then a flag or handkerchief



is extracted from it. While the audience is still wondering how it was done the operator reaches into a coat pocket, produces the candle lighted, and places it back in the candlestick. The apparatus required consists of the trick candlestick illustrated, two imitation candles, a cardboard cylinder, and a silk flag, or handkerchief. The base of the candlestick is hollow, and when the cylinder is placed over it, a trigger is pressed that allows the candle to drop out of sight into the hollow base. The flag is folded and placed like a lining within the cylinder, and is kept from sight of the audience by a paper lining, as indicated in the drawing. The cylinder is prepared and the second candle placed in the magician's pocket before the performance. This candle has a match head for a wick, and as it is taken from the pocket the match is struck on a piece of sandpaper that is pinned in a convenient place on the inside of the coat. The candlestick can be bought ready-made, or it may be made from wood. The hole in which the candle drops must be large enough to make a snug but free fit, and deep enough to conceal the candle entirely when resting upon the bottom. A small wire pin projects through the can-

dlestick just far enough to hold the candle in place, yet so that a very little movement will release it. A bent strip of sheet metal serves as a trigger, and this is fastened at its center to the candlestick, very loosely. When the cylinder is placed over the candle the performer presses the trigger and lets the candle fall. In this position the top of the candle should be even with the wire pin, so that when the second lighted candle is set in the candlestick it will rest on top of the first one. The candles can be made from metal, paper tubes, or wood. If tubes are used, corks are inserted into the ends to hold wicks. In any case, have a wick on one candle and a small hole for a wick on the other. Enamel them white. For the light effect in the second candle, a match end is inserted in the wick hole. The cylinder which is put over the candle to hide it can be made from cardboard or sheet metal and finished as desired. Fold the flag and place it so as to be close to one end of the tube. When taking the flag from the cylinder, hold the cylinder and the paper lining tightly together, at the end farthest from the flag, so that the latter can be pulled out without disturbing the paper.—Norman B. Taylor, Pomona, Calif.

An Efficient Stewpan

The efficiency of the ordinary stewpan can be considerably increased, and at the same time, the quantity of gas required to boil the contents of the pan will be cut down. All this is done by cutting a hole, just large enough to permit insertion of the stewpan, in the bottom of an old pan, as in the

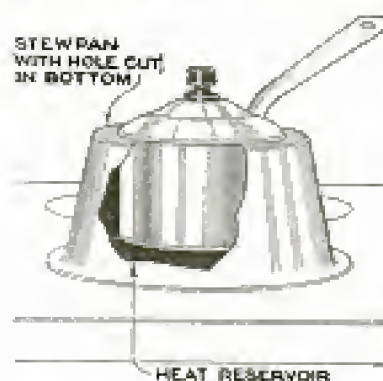


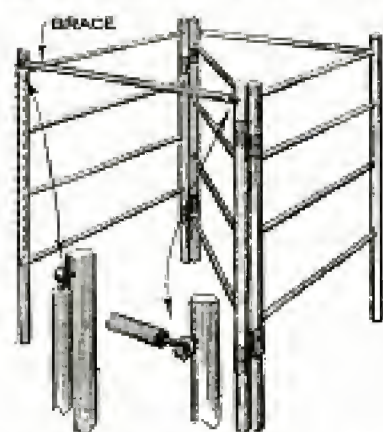
illustration. It will be noted that all the heat rising within the covered area will come into contact with the sides as well as the bottom of the upper pan. Another feature of value that commends an arrangement of this sort, is that the contents of the stewpan will not burn as quickly as when in actual contact with the stove top. As a glue-pot improvement, where gas is used for heating the pot, the same idea can be applied with excellent effect.

Typewriter-Ribbon Substitute

When the typewriter ribbon wears out and another is not easily obtainable, a sheet of carbon paper can be used with good results. The carbon paper is fed into the machine between two sheets of paper, with the carbon face in contact with the face of the letterhead. The outer sheet of paper is used to reinforce and protect the carbon paper.—Chas. N. Shaw, Jr., Gordon, Ga.

Bracing the Folding Clotheshorse

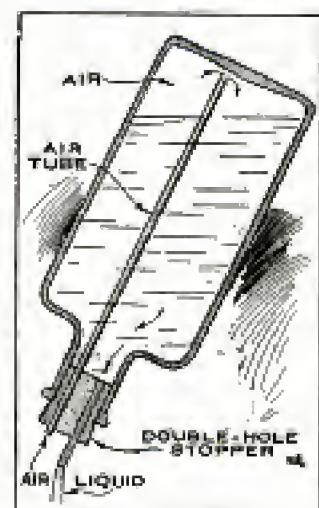
The common folding clotheshorse admirably answers the purpose it is intended



for, but suffers from lack of stability, a slight push being enough to make it fall over or close. To overcome this, the two bars or braces shown in the drawing were fitted to the clotheshorse, not only making it much more rigid, but affording additional drying space. Round-headed screws were turned into the posts as indicated, and a screweye into each end of the braces. One of the eyes was closed, while that in the opposite end is open and free to slip over the screw.—M. E. Duggan, Kenosha, Wis.

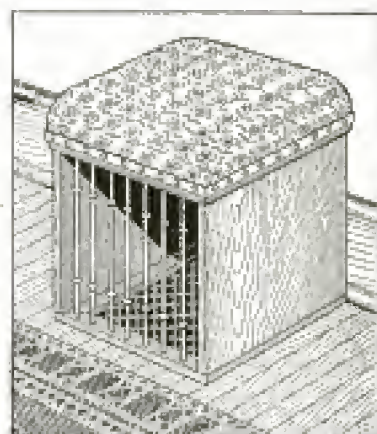
Attachment for Pouring Liquids

One of the easiest and most effective methods of rigging a bottle for pouring liquids without removing the cork is shown in the drawing. Two pieces of glass tubing are inserted through holes in the stopper in the manner indicated. Using an arrangement of this character, the liquid will flow from the container smoothly and without bubbling.—Curtis Ralston, Chicago, Ill.



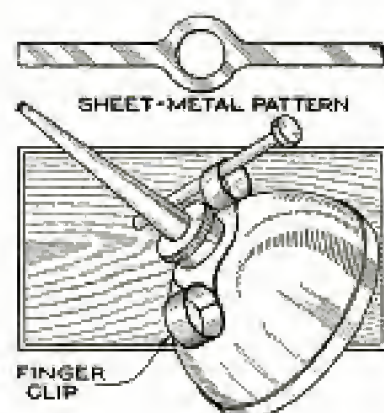
A Seat for the Furnace Register

In houses heated by a hot-air furnace, a better distribution of the warm air along the floor, where it is most needed, can be obtained by using register boxes such as that shown in the drawing. In addition to this, it affords a convenient seat for getting warm quickly when coming from the outside cold. The box is a little larger than the outside measurements of the register plate, and at least one side should be open. The top may be padded and covered to match the upholstery on the furniture in the room.



Finger Clips for Oilcans

A simple device, which has been found advantageous in the handling of an oilcan of the spring-bottom type, especially

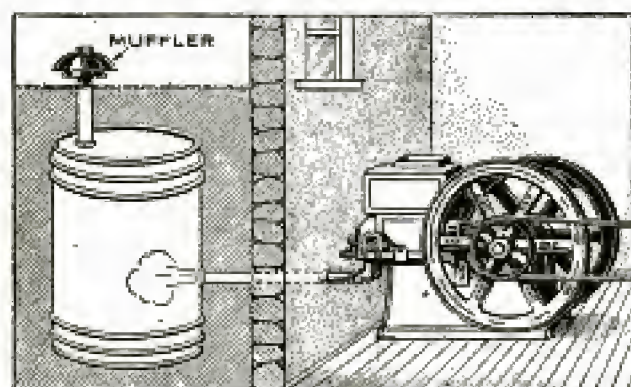


when the hands are greasy, consists of a finger clip, made and attached as indicated. The clip is made from a strip of sheet metal, with an opening at the center to fit over the neck of the can, where it is held in place by the spout. The ends of the sheet-metal strip are formed into rings for the insertion of the first and second fingers. All edges should be finished off smoothly to prevent possibility of cutting and scratching the skin. The oilcan may also be hung up by the clip, and in this manner kept out of the way.

When playing cards become old, worn, and rough, making it difficult to deal and shuffle them with the desired speed, they can be made almost as slick as new by dusting them freely with talcum powder.

Silencer for Home-Lighting Plants

One of the objectionable features of a lighting plant, as it is usually installed in the basement of the country home, is the noise and odor of the exhaust. The drawing shows a method of muffling the

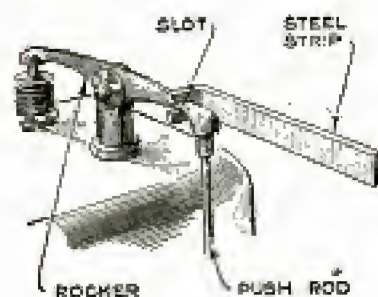


An Underground Expansion Chamber in the Form of a Barrel or Old Hot-Water Tank Receives the Exhaust from the Home-Lighting Plant and Makes Its Operation Practically Noiseless

sound of the exhaust that makes operation of the plant practically noiseless. The regular engine muffler is removed and the exhaust pipe is led to a barrel or old water-heating tank that is buried under the ground. A pipe from the tank or barrel, as the case may be, is led above the surface and the engine muffler attached, as shown in the drawing. By this method the exhaust gases are discharged into the barrel, where they expand and issue from the muffler at little more than atmospheric pressure and without the annoying noise.

Rocker Lever for Overhead Valves

A tool that expedites the removal of valves or push rods from an overhead-valve type of automobile engine, is shown



in the drawing. With an average of 12 such valves to be removed from the engine, considerable time and effort are saved by the use of some form of tool

for compressing the valve spring. The tool consists of nothing more than a strip of steel, bent at right angles and slotted as indicated. The long part forms the handle, and when applied to the rocker arm, only an upward movement of the handle is necessary to raise the rocker out of contact with the push rod.

Protecting Fire Hydrants from Snow

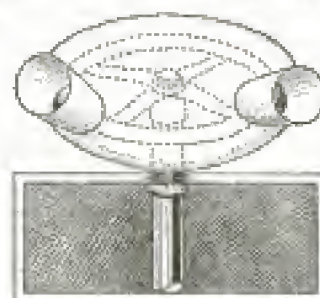
In regions of heavy snowfall, and where the snow is likely to remain until it thaws, such as the grounds of large public institutions, the fire hydrants are quite likely to be so covered up, that valuable time might be lost in locating them. Under such conditions some way of marking the locations of the hydrants is highly desirable.

The hydrants can be effectively identified and, to a certain extent, prevented from freezing up, if, early in the winter, they are covered up with a barrel from which one of the heads has been removed. It is consequently an easy matter, in case of fire or fire drill, to lift off the barrel without having to dig the snow from around the hydrant.—James R. Noble, Portsmouth, Ont.

A Muff for the Autoist's Hands

Driving an open automobile in the winter time is far from comfortable, even when the side curtains are up, and, if the driver's hands are numbed with cold, it is easy to imagine situations where driving would be dangerous.

The drawing shows a closely woven cloth muff, in the form of a bag, made large enough to fit loosely over the steering wheel, the mouth of the bag being tied to the steering column. Openings for the hands are provided with elastics, so that the muff will be held closely to the wrists; or cuffs, such as shown, can be added to fit over the coat sleeves.



An "Apartment" Ironing Board

A convenient ironing board for the particular use of apartment dwellers, or those living in rooms where the amount of space is closely limited, can be made from an ordinary board, about 3 ft. long and 10 in. wide. This is all that is needed, with the exception of the necessary covering. In use, the drawer of the kitchen table, or a convenient drawer in a dresser, is pulled out, and the board is supported by the drawer, the end of the board being inserted inside the drawer so that it bears against the top of the opening.—R. Swedene, San Francisco, Calif.

Razor Slogan-Winner, L. G. Cherry,
1200 W. Franklin Ave.,
Minneapolis, Minn.

"Fewer Strokes for Better Shaves" PRIZE OFFERS

CASH PRIZES OFFERED FOR NEEDLEWORK BY STAR NEEDLEWORK JOURNAL

Cash prizes to the amount of \$2,000 are offered for crochet, tatting, knitting, and embroidery work by the Star Needlework Journal. The contest is limited to work done with cotton thread made in America. All articles submitted must be specially made for this contest. Securely sewn to the article submitted must be a coupon which is part of a circular that contains full particulars of the many classes of work for which in each case a number of prizes are offered, varying in value from \$100 to \$1. In addition to these regular class prizes, three special prizes will be given, one of \$200 for the best piece of work entered in the contest, one of \$100 for the best original design in colored work, and one of \$100 for the best original design in white work. Competitors may enter in as many classes as desired, but will receive only one prize except those who are winners of special prizes. Work should not be sent in before December, 1921. The contest closes Jan. 31, 1922. For circulars and entry blanks, address Star Needlework Journal, 260 West Broadway, New York City.

THE SKETCH, OF LONDON, ENG., OFFERS £100 FOR BEST ANSWERS TO THREE QUESTIONS

In the current issues of The Sketch, the well-known illustrated paper published in London, Eng., there is offered a prize of £100 for the best answers to the three questions: "What feature in The Sketch do you like best?" "What feature do you like least?" "What feature not at present published in The Sketch would you like to see introduced?" Each set of answers is to be written on a sheet of paper and signed with a pen name, accompanied by another sheet of paper bearing the pen name and the actual name and address of the contestant. The contest is open to everyone, whether a reader of The Sketch or not. Answers must reach The Sketch office, 15 Essex St., Strand, London, W. C. 2, before Jan. 1, 1922.

ONE MILLION FRANCS FOR BEST MOTOR OFFERED BY AERO CLUB OF FRANCE

The aviation commission of the Aero Club of France has now under consideration the rules that will govern a contest for a prize of one million francs (normally \$200,000), which it offers for the best motor, produced before June 1, 1923, for service on commercial airplanes. The prize will be given to the designer of the motor that proves to be the most durable, the most reliable, and the simplest and easiest to assemble and disassemble.

PRIZE FOR BEST SLOGAN DESCRIBING DURHAM DUPLEX RAZOR

Every storekeeper handling Durham duplex razors has blanks for distribution to all applicants in connection with a prize of \$500 offered by the razor company for the best slogan of five words or less describing the shaving qualities of the razor. The contest will last until June 30, 1922. Blanks can be obtained also direct from the Durham Duplex Razor Co., 190 Baldwin Ave., Jersey City, N. J.

PRIZES FOR GEORGE WASHINGTON ESSAYS OFFERED STUDENTS OF FIVE STATES

With the object of encouraging a careful study of the life of George Washington, the Chicago Tribune offers a number of prizes, totaling \$11,000, for the best essays of 250 words or less upon that subject. The contest is open to every boy and girl attending grammar or high school, parochial, or private school in the city of Chicago, or in the states of Illinois, Indiana, Iowa, Michigan, and Wisconsin. The writer of the best essay submitted will receive \$2,500 in cash. Sixty other prizes ranging from \$500 to \$25 will be paid for

the best essays submitted from the six territorial divisions mentioned above, in each case as follows: first prize, \$500; second, \$250; third, \$100; fourth to tenth, \$25 each. There are also 18 cash prizes for teachers whose students submit the winning essays, as follows: in each of the six territories, \$250 to the teacher whose student wins the first prize; \$150 for the second prize, and \$100 for the third prize. All essays must be original. In case of ties, the full sum offered will be paid to each winner. The contest is now open, and will close at midnight of Washington's birthday, Feb. 22, 1922. Address: "Essays," The Chicago Tribune, 7 South Dearborn St., Chicago, Ill.

A BUNGALOW AS A CHRISTMAS PRESENT OFFERED IN NOVEL PRIZE CONTEST

A \$5,000 bungalow, as a Christmas present, was recently offered by the Leiter Building Stores, Chicago, Ill., in a contest of quite a novel nature. A four-room bungalow was erected inside the store, and the contestant was required to describe the best manner of expending \$2,000 in furnishing it completely with goods shown anywhere in the Leiter Stores. Everyone entering the contest had to call at the bungalow for an instruction sheet. Certainly every contestant would have to make a very thorough inspection of the goods displayed throughout this extensive department store, and doubtless the owners' recompense was this novel method of advertising their wares.

CONTESTS PREVIOUSLY ANNOUNCED

Students of Railroad Engineering: Scholarships; announced March issue, 1920; closes Dec. 31; offered by the Southern Pacific.

Essays on the Life of Roosevelt: Scholarship prizes valued at \$1,000, \$750, and \$500; announced August issue, 1920; closes Dec. 31; address, Woman's Roosevelt Memorial Association.

New Methods of Testing Hardness of Metals: Prize \$1,000; announced October issue, 1920; closes Jan. 1, 1922; address, Institution of Mechanical Engineers, London, England.

Essays on Economics: Prizes, \$1,000 and \$500; announced June issue, 1921; closes Dec. 31; address, Dr. Wm. T. Foster, Newton 58, Mass.

Medals, Diplomas, and Money Awards: Announced August issue, 1921; awards offered by the Franklin Institute.

For Service to City of Philadelphia: Prize \$10,000; announced September issue, 1921; awarded in spring or summer of 1922 by Edward Bok, former editor of The Ladies Home Journal.

Orchestral-Composition Contest: Prize \$1,000; announced September issue, 1921; closes, Jan. 1, 1922; address, Carl D. Kinsey, 624 S. Michigan Ave., Chicago, Ill.

Safety-First Essays: Prizes, a trip to Washington and gold watch, a gold loving cup, a silver loving cup, and other state prizes; announced September issue, 1921; closes late in the fall; address any public-school teacher.

Essays on Cruelty of Trapping: Prizes, \$100, \$75, \$50, and 2 special prizes, \$50 and \$25; announced Oct., 1921; closes Dec. 31, 1921; address, American Humane Association, Albany, N. Y.

Research Thesis by a Woman: Prize \$1,000; announced October issue, 1921; closes Feb. 25, 1922; address, Dr. Lillian Welsh, Goucher College, Baltimore, Md.

Model in Clay by Students of Chicago Art Institute: Prizes, \$1,000, \$100, and \$50; announced November issue, 1921; closes April 15, 1922; address, Daily News Office, 15 N. Wells St., Chicago, Ill.

Best Stories of Infantry Platoons in Late War: Prizes, \$100, \$50, \$25, and \$15; announced November issue, 1921; closes Dec. 31, 1921; address, Army and Navy Journal, New York City.

Best Short Stories: Prizes, 10 of \$100 each; announced November issue, 1921; closes Dec. 31, 1921; address, True Stories Magazine, New York City.

Pulitzer Prizes and Scholarships to be Awarded Annually: Announced December issue, 1921; address, Secretary of Columbia University, New York City.

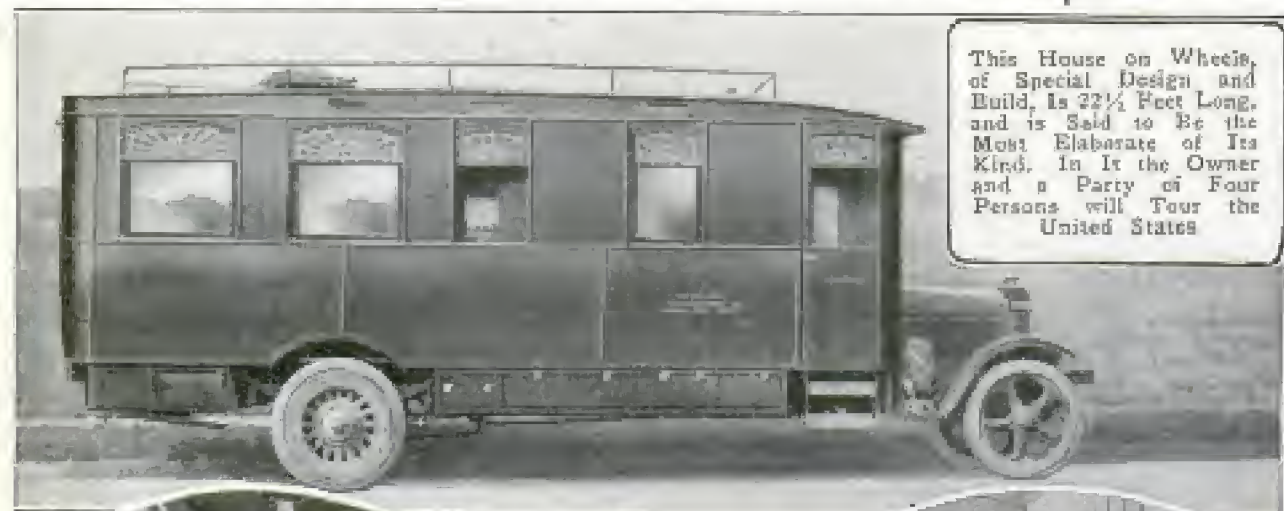
Best Canadian Novel and Story: Prizes, \$2,500, and \$500; announced December issue, 1921; closes June 1, 1922; address, Hodder & Stoughton, Limited, 263 Adelaide St. West, Toronto, Can.

Best Stories of Adventure on Naval Vessels in the War Zone: Prizes, \$100, \$50, \$25, and \$15; announced December issue, 1921; closes Jan. 31, 1922; address, Army and Navy Journal, New York City.

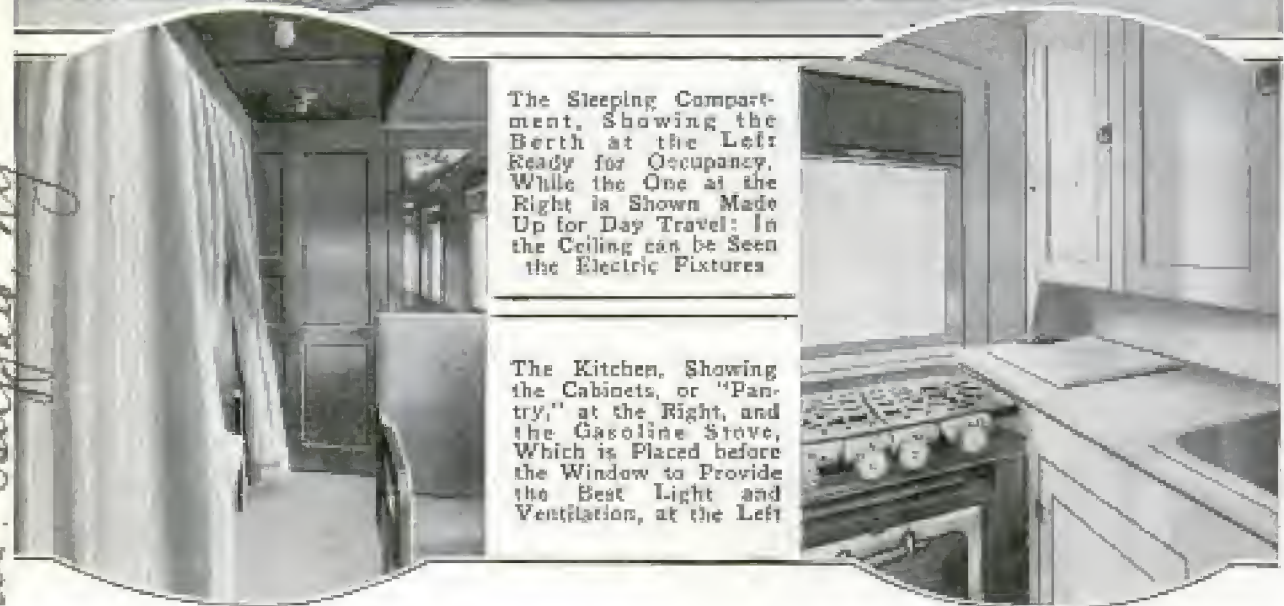
¶ Postmaster-General Hays has issued orders that the resources at the command of every postmaster in the United States shall be placed at the disposal of persons in search of missing relatives or friends. In future anyone will receive all possible assistance in tracing missing men, women, or children, by applying to the postmaster of his district.

¶ A party giving the name of J. Adams, claiming to represent the Magazine Service Co., of Chicago, is offering an atlas free and a year's subscription to this magazine at a cut rate. The Magazine Service Co. and its agents are frauds so far as having any authority to represent this magazine is concerned.

ELABORATE HOUSE ON WHEELS FOR COUNTRY TOURS



This House on Wheels, of Special Design and Build, is 22½ Feet Long, and is Said to Be the Most Elaborate of Its Kind. In It the Owner and a Party of Four Persons will Tour the United States.



The Sleeping Compartment, Showing the Berth at the Left Ready for Occupancy, While the One at the Right is Shown Made Up for Day Travel: In the Ceiling can be Seen the Electric Fixtures

The Kitchen, Showing the Cabinets, or "Pantry," at the Right, and the Gasoline Stove, Which is Placed before the Window to Provide the Best Light and Ventilation, at the Left

An elaborate house on wheels, containing many modern conveniences, has recently been completed. The house, or body, which is built upon a five-ton motor-truck chassis, is 7½ ft. wide, and the roof is 10 ft. from the ground. All the windows are of French plate glass, and fitted with copper screens. A porch slides from beneath the body at the rear and may be

covered with an awning. The driver's compartment is a combination seat and bed, and an aisle runs from it to the rear. Off the aisle is a bathroom with modern plumbing fixtures, and a kitchen fitted with a gasoline stove, electric grill, sink, refrigerator, and hot and cold water. In the rear is a combination living and sleeping room, with four folding berths.

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid all appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor.]

Designed & Built
André Boutin, Syracuse, N.Y.

Chassis - Arrow Motor Car Co.
Syracuse, N.Y.
7510

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Build an Aladdin Home and Save \$200 to \$800



Delightful Colonial Bungalow of 5 Rooms

Aladdin success is chiefly due to the money saved for Aladdin home owners. You will save a substantial amount thru eliminating dealer's profits, saving over 18% waste in lumber and lowering labor costs in building. Aladdin homes come to you direct from one of our mills located in the nearest timber country, thereby reducing freight charges. They are built of standardized materials, saving waste, and are cut to fit, saving hundreds of hours of carpenter labor. Over a hundred beautiful and modern homes are pictured and priced in the Aladdin catalog. Send for this catalog at once.

Plan Your Spring Building NOW!

If you write for the Aladdin book now, you will have plenty of time to study the plans, learn about the savings and arrange your affairs for the spring building season. Without cost you will receive the benefit of our seventeen years' experience in building homes for American families in every state and practically every village, town and city. Start your home planning this month.

Aladdin Homes Reduce Labor and Lumber Costs

The lumber that's wasted costs just as much as the lumber that's used. Aladdin can prove to you a saving of practically every fifth dollar spent for lumber. That's surely worth while. Aladdin can prove a saving of practically every fourth dollar in labor. That's worth saving too. Will you be satisfied to build without getting the Aladdin catalog and proving these statements?

Sold Direct—No In-Between Profits

The Aladdin Company is the greatest home building institution in the world, and it does not sell through dealers. It manufactures the lumber at the edge of the four greatest timber-producing states. It prepares the house complete ready to be shipped direct to the home builder. You save the dealer's profits. Your carpenter nails the ready-cut lumber just like in any other first-class, permanent home. The catalog explains details fully.

There's an Aladdin Near You

Ask for the name of an Aladdin home owner near you. Talk with him, inspect his home, look at the beautiful clear and knotless siding, the handsome interior woodwork, the staunch construction, ask about the warmth in winter.

Aladdin Homes Not Portable

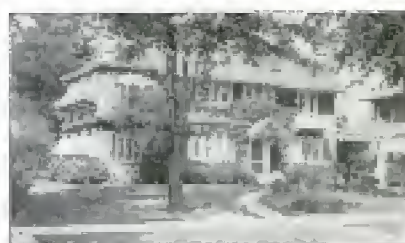
Aladdin homes are not portable, not seasonal, not "fabricated." When erected they are exactly like any well-built, architect-designed, contractor-built home. They are guaranteed to pass the building codes of every city.

What You Get When You Buy an Aladdin Home—Aladdin homes are designed to use standard lengths and sizes of lumber so that there is practically no sawing, measuring or fitting to be done by the carpenter on the job. You receive in one shipment all the timbers, frame work, millwork, the siding, outside finish, porch, shingles, windows, doors, interior woodwork, bath, glass, nails, hardware, lock sets, paints, stains and varnish. Send stamps today for catalog 1567.

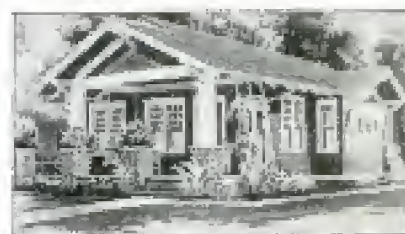
THE ALADDIN CO., Bay City, Mich.

Branches; Offices and Mills: Portland, Oregon; Wilmington, North Carolina; Hattiesburg, Miss.

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A Snuggly Home of 12 Rooms



Typical Bungalow of 6 Rooms

Coupon for Book of Homes

THE ALADDIN CO. (Send to Address of Office Nearest You)

Enclosed find stamps for your Book No. 1567

My Name _____

Street _____

City _____

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Works of the Western Electric Company: the manufacturing department of the Bell System

Economical Equipment

Forty years ago the management of the Bell Telephone System organized for a supply of the apparatus which it foresaw would be required in the development of its new industry—telephone service.

The telephone in some countries is the luxury of the rich, but in America it is used by practically all the people. This universal service is due in large measure to foresight in engineering and manufacture.

Switchboards with millions of parts, other apparatus of highest efficiency, and all necessarily of complex and intricate design, cables and wires and a multitude of technical devices enable our country to lead the world in telephone service.

All this telephone equipment is

made in a factory which is recognized throughout the world as having the largest production and the highest standards of workmanship and efficiency.

This factory, controlled through stock ownership by the American Telephone and Telegraph Company, has been for forty years the manufacturing department of the Bell System; with the result that the associated companies secure equipment of the highest development, made of the best materials, produced in accordance with the requirements of the public, and with the certainty of moderate costs.

Economy in the Bell System begins with the manufacture of equipment.

“ BELL SYSTEM ”

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES

*One Policy, One System, Universal Service, and all directed
toward Better Service*





No. 1555
(illustrated)
Length 17 in.
3-jaw chuck for
round shank
drills up to $\frac{1}{2}$ inch.

No. 555
Length 17 $\frac{1}{4}$ in.
2-jaw chuck for
round or square
shank drills up
to $\frac{1}{4}$ inch.

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Numerous illustrations.
Shows how to save time
and labor. Pictures work
of a difficult nature be-
ing done easily and quick-
ly. Features of "Yankee"
Tools explained.

Some other "YANKEE" Tools

Spiral Screw-drivers	Bench Vices, removable base
Quick Return Spiral	Ratchet Chain Drills
Screw-drivers	Ratchet Bench Drills
Ratchet Screw-drivers	Plain Hand Drills
Plain Screw-drivers, 1 $\frac{1}{4}$	Plain Breast Drills
to 30 in. blades	Automatic Push Drills
Ratchet Hand Drills	Ratchet Tap Wrenches

Dealers everywhere sell "YANKEE" Tools

NORTH BROS. MFG. CO., Philadelphia

"YANKEE" TOOLS

Make Better mechanics



Hanes Guarantee!

We guarantee Hanes Underwear absolutely—every thread, stitch and button. We guarantee to return your money or give you a new garment if any seam breaks.

Hanes 5 Big Features

- 1 HANES STANCH ELASTIC SHOULDERS made with service-doubling lap seams. They fit right with give for every motion.
- 2 HANES TAILORED COLLARETTE won't gap or roll. Fits snugly around your neck always, and keeps the wind out.
- 3 HANES ELASTIC CUFFS are made far stronger and better than the usual cuff. They fit the wrist firmly, they won't dare or rip from the sleeve.
- 4 HANES CLOSED CLOSURE is cut and stitched a special way that really keeps it closed.
- 5 HANES ELASTIC ANKLES hold their shape through repeated washing. They don't bunch over your shoes. They fit always.

All Hanes Union Suits made with reinforced buttonholes.

Buy Hanes Now at Greatly Reduced Prices!

Now is the time to equip yourself with Hanes Winter Underwear. You can buy it at much lower prices than at any time in recent years. There have been tremendous price reductions in the entire Hanes line. Hanes value is unsurpassed.

And remember—each Hanes garment is backed by the Hanes Guarantee. It must live up to the claims made for it or you can have your money back.

Each Hanes garment has to pass inspection by experts before it reaches you. The sterling features listed in this advertisement are all checked over.

P. H. HANES KNITTING CO., Winston-Salem, N. C.

That's why you can rely on Hanes buttons to stay on; the reinforced buttonholes to keep their shape; the non-irritating seams to hold fast.

Have your dealer show you the Hanes winter line. You have a choice of heavy shirts and drawers, and heavy union suits in two weights; and a splendid mediumweight, silk-trimmed union suit.

Union Suits for Boys—In two weights—medium and extra heavy. Made in sizes 2 to 16 years. Two to 4 year sizes have drop seat.

If your dealer can't supply you with Hanes, write us immediately.

Next Summer You'll want to wear Hanes Nainsook Union Suits!



Be More Careful

of your teeth—combat the film

If you are brushing your teeth in a wrong way, learn what this new way means.

Authorities now advise it. Leading dentists everywhere are urging its daily use. Millions of people employ it.

Make this ten-day test and let the results show you what clean teeth mean.

That dingy film

Film is that viscous coat you feel. It clings to teeth, enters crevices and stays. That is what discolors—not the teeth.

Film is the basis of tartar. It holds food substance which ferments and forms acid. It holds the acid in contact with the teeth to cause decay.

Germes breed by millions in it. They, with tartar, are the chief cause of pyorrhea.

Dental science has in late years found two ways to fight film. It has proved them by careful tests. Now they are embodied in a new-day toothpaste—called Pepsodent—for daily application.

Other new effects

Pepsodent brings three other effects, natural and very important.

It multiplies the salivary flow—Nature's great tooth-protecting agent. It multiplies the starch digestant in the saliva, to digest starch deposits. They may otherwise cling and form acids.

It multiplies the alkalinity of the saliva, to neutralize the acids which cause tooth decay.

Thus every use does five things which dental authorities now regard as essential.

You'll quickly see

A 10-day tube of Pepsodent is sent to all who ask. That shows the delightful effects. In a week you will realize that this method means much to you and yours.

Send the coupon for it. Note how clean the teeth feel after using. Mark the absence of the viscous film. See how teeth whiten as the film-coats disappear.

Watch all the effects, then read the reasons in our book. That test may lead to life-long benefits. Cut out the coupon now.

Pepsodent PAT. OFF.
REG. U.S.

The New-Day Dentifrice

A scientific film combatant, whose every application brings five desired effects. Approved by highest authorities, and now advised by leading dentists everywhere. All druggists supply the large tubes.

10-Day Tube Free

776

THE PEPSODENT COMPANY,
Dept. 515, 1104 S. Wabash Ave., Chicago, Ill.
Mail 10-Day Tube of Pepsodent to

Only one tube to a family.

A Great Year to Succeed!

A renowned predictor has said: "In 1922 success is due."

Success to those who are **MASTERS OF THEIR TIME.**

You can only be master of your time when you possess a thoroughly reliable, reputable high grade watch. There is no watch made that excels **THE SANTA FE SPECIAL** in reputation, reliability or workmanship. He who owns one always knows his time.

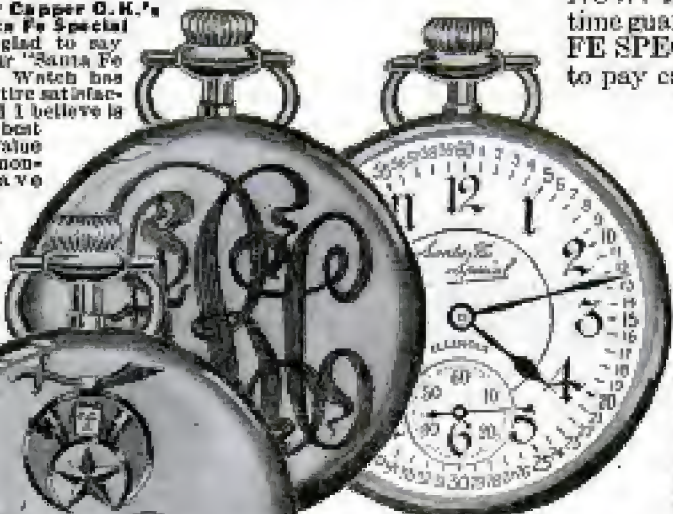
We expect to put this Great Watch into the pockets of 50,000 men who are on the road to success in 1922. With this as our goal we have made our margin of profit on the sale of a watch so small it defies competition.

Will you be one of the 50,000? If you expect to succeed you must act—**ACT NOW!** If you want a great watch with a life-time guarantee, do not delay—order a **SANTA FE SPECIAL** this minute! You do not have to pay cash—we trust you. **ACT NOW!**

Senator Copper O.K.'s

Santa Fe Special
I am glad to say that your "Santa Fe Special" Watch has given entire satisfaction, and I believe is the very best watch value for the money I have ever seen.

ARTHUR CUPPER,
United States Senator.



Always Thrive

Pres., Santa Fe Watch Co., Topeka, Kans.

The ILLINOIS Famous \$3.50
Santa Fe Special
21 JEWEL RAILROAD WATCH **3 MONTH**

The Standard Railroad Watch

that is **GUARANTEED FOR A LIFE-TIME OF SATISFACTORY SERVICE.** These watches are now in service on practically every rail-

road in the United States and in every branch of the Army and Naval Service. Thousands of them are distributed around the world. Your name or monogram and any emblem you may desire will be engraved in the case to suit your own ideas.

Save One-Third to One-Half Your Money

Save One-Third to One-Half the price you pay for a similar watch made by other manufacturers. Most Liberal Offer Ever Made. Our "Direct-to-You" low wholesale terms and Extra Special Distribution Plan is fully explained in the New Santa Fe Special booklet just off the press. The "Santa Fe Special" Plan means a big saving of money to you and you get the best watch value on the market today.

Send Your Name Today

Clip the coupon, fill out and receive the beautiful FREE 52-page, 4-color art watch book. All the newest watch case designs are shown. Read our easy payment offer. READ the so-called secrets of watchmaking and the jeweler's trade—tells how we can sell Railroad watches at practically half the price charged by retail jewelers. READ our great "Direct-to-You" offer. **DON'T BUY A WATCH UNTIL YOU HAVE SEEN THE "SANTA FE SPECIAL."**

Watch sent for you to see without one penny down.

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16 Thomas Bldg., TOPEKA, KANS.

A letter, post card or this coupon will bring my beautiful Watch Book FREE

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16 Thomas Bldg., Topeka, Kans.

Please send me your New Watch Book with the understanding that this request does not obligate me in any way.

Name.....

Address.....

State.....



Your Choice, On Trial

THE Wurlitzer plan gives you any instrument with a complete musical outfit for a week's Free Trial in your own home. No obligation to buy. Return the instrument at our expense at the end of the week, if you decide not to keep it. Trial won't cost you a penny.

Monthly Payments

Payments are arranged in small monthly sums. A few cents a day will pay for your instrument and complete outfit. The Wurlitzer plan gives you all at direct cost. You get the outfit and instrument practically for the cost of the instrument alone.

Artistic quality of Wurlitzer instruments is known all over the world. Wurlitzer instruments have been used

by artists and in the finest orchestras and bands for years. The house of Wurlitzer has made the finest musical instruments for more than 200 years.

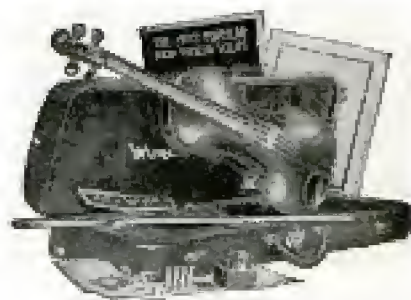
Complete Outfits

The new plan includes with the instrument everything that you need—velvet and plush lined carrying case with lock and key, all accessories and extra parts, sell instructor, book of musical selections, etc.

A Wurlitzer Outfit

This shows the Wurlitzer Violin Outfit. Case is professional style, beautifully finished. Complete outfits like this are now furnished with all Wurlitzer instruments.

Every musical instrument known, including Pianos and Victrolas, is embraced in the Wurlitzer plan.



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Every known instrument illustrated and fully described in detail with prices, monthly payments and free trial blank. More information and pictures of instruments than in any other book published. (Also complete catalog of accessories, repairs, strings and all needs for replacements for any instrument made. Instant mail service.) Book is absolutely free. No obligation. Send the coupon now.

The Rudolph Wurlitzer Company

Cincinnati, Ohio Chicago, Illinois New York, N. Y.

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THE RUDOLPH WURLITZER CO., Dept. 1771
117 E. 4th St., Cincinnati; 700 Jackson Blvd., Chicago; 120 W. 42nd St., New York

Send me your new catalog with illustrations in color and full description of the Wurlitzer Complete Outfits and details of the free trial and easy payment offer.

Name.....

Address.....

(State musical instrument in which you are especially interested)



GIVEN Joseph R. Brown gave the world the invention of the Vernier Caliper in 1851, he established a world-wide Standard of Accuracy—over 70 years ago he brought out *these first precision tools*.

Today, as then, Brown & Sharpe Machinists' Tools represent the accuracy and fine workmanship which only pride in product and experienced master craftsmen can accomplish—they help you work your best.

See these superior tools—over 1000 of them, in our Catalog No. 28—send for it today

The first precision tools in America were Brown & Sharpe Tools
They are the best tools today



BROWN & SHARPE MFG. CO.

Providence, R. I., U. S. A.

The tool with
the 5 Big
Bull-Dog
Features



Eleven handy
tools, plain
and ratchet,
each threading
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OSTER
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Write for Folder 31-B
illustrating and de-
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plified pipe-threading.

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NOW is the time to build your Harris Home!

And here is a mighty organization of thirty great departments ready to serve you. Managed by expert material buyers, designers and practical builders. We have vast stocks bought at huge quantity price savings which are now at your command. Our sole aim and purpose is

To help you get a home that will prove entirely satisfactory at a price that will mean a substantial saving in actual dollars of your money.

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So sure are we of the super-excellence of our material and our GUARANTEED Ready-Cut System that we will ship you any HARRIS HOME without the payment of one cent down. Our Plan Book explains our liberal terms fully.

FREE Plan Book

The latest edition is waiting for you, contains our FREE PLAN OFFER and photographic reproductions, with floor plans and specifications of 100 beautiful homes. Mail coupon today.

Building Material of All Kinds

For over a quarter of a century, thrifty wise buyers have realized that here is the "open door" to real economy, whether it be a brand new home or material for improvements or repairs. Our big stocks of brand new building material, all purchased in tremendous quantities at savings that are passed along to you are ready for quick and complete shipments.

"PRESTO-UP" Patented Bolt-together Buildings!

The wonder buildings of the age. Guaranteed buildings, for quick industrial housing. Individual Homes, etc., extra strong, practical and suitable for all year 'round habitation in any climate. 50 different plans. They come to you in easily handled sections—painted and stained, ready to bolt together and move in.

Plumbing and Heating!

Hot water and heating systems, warm air heating plants, pipeless furnaces and plumbing material of every kind—the product of America's leading makers. Our mammoth plumbing stock offers unlimited possibilities for you to save money. Our heating plants are guaranteed to heat your home in any weather with big fuel economy. Mail the coupon for our Plumbing and Heating Book and get the benefit of our Expert Engineering Service.

Department NM-7

HARRIS BROTHERS CO.
1349-1525 W. 35th St., CHICAGO

FREE BOOK of Plans

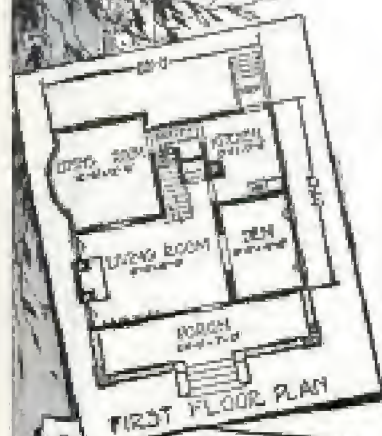
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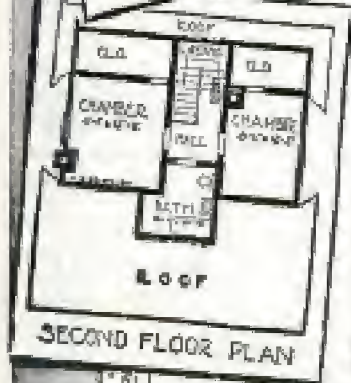
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| <input type="checkbox"/> Harris Home Book of Plans | <input type="checkbox"/> Book of "Presto-up" Houses and Garages |
| <input type="checkbox"/> Building Material Catalog | <input type="checkbox"/> Plumbing and Heating Book |

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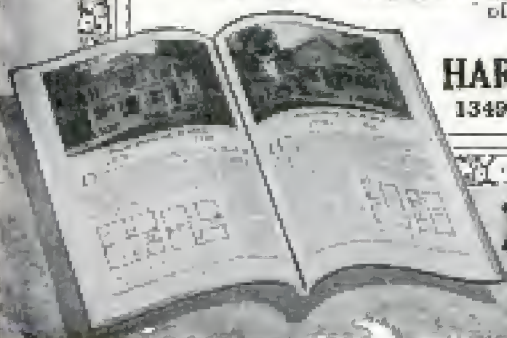
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FIRST FLOOR PLAN



SECOND FLOOR PLAN





The 1922 Elto is now ready—

Ole Evinrude's new motor, his greatest achievement! Two-cylinder construction, only 47 pounds. Practically vibrationless, starts easily, tilts automatically; 19 exclusive features explained in the Elto booklet. Write for it today.

ELTO OUTBOARD MOTOR CO.
OLE EVINRUDE, Pres.
Dept. A, Mfrs. Home Bldg.
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Comfortably
Portable

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Light Twin Outboard Motor

Always Plenty of Stretch

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SUSPENDERS

Guaranteed One Year—Price 75¢

Ask your dealer for
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Accept no substitutes—Look for name on buckles.
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Sousa and nine other world-famous musicians tell how you can quickly learn to play saxophone, cornet, trombone, clarinet, any band or orchestra instrument and double your income and pleasure.

Free Trial Any Conn Instrument

Used by greatest bands and solo artists.

Highest honors at world expositions.

Easiest of all to play. Send post card

for free book and details of free trial plan.

C. G. Conn, Ltd.

131 Conn Bldg. Elkhart, Indiana

World's Largest Manufacturers of High
Grade Band and Orchestra Instruments



—action

—with the New Stromberg Carburetor is as quick as thought. A rush of power instantly follows the demand on your engine. Efficiency is always on its finest edge. On the traffic choked boulevard or out in the open stretches, you are master. You can slow down to a snail's pace—surge ahead at express speed—stop—start, all will—your machine is under control.

In addition to this—you get most miles per gallon. These are facts—proved absolutely by service and fully explained in literature, which will be sent you upon request. Write for it. State make, year and model of your car.

Stromberg Motor Devices Co.
64 East 25th Street
Chicago, Illinois
Dept. 114



New **STROMBERG** Does it!
CARBURETOR



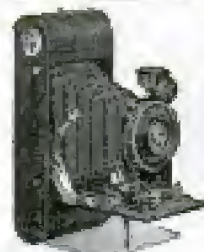
ADD TO YOUR INCOME

\$5 TO \$10 A DAY MADE EASY

The New Improved Am. Jr. No. 2 is
A Wonder

Sharpens and stropps ordinary
razors. Sharpens razor blades,
scissors, etc.

Complete outfit for only \$85
AM. SHARPENING MACHINE CO.
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Send for new illustrated catalog showing
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10 days' trial given

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A LATHER THAT SOOTHES

Palmolive Shaving Cream gives a full, creamy lather that makes the beard wash like. The razor moves smoothly. Palmolive is also a lotion. Contains both Palm and Olive oils. Write for free trial tube. Large size tube at drug stores.

THE PALMOLIVE COMPANY, Milwaukee, U. S. A.
PALMOLIVE SHAVING CREAM

Try This Typewriter 5 Days FREE



\$4 DOWN—Ten Months to Pay!

Save more than half on any standard make. Every machine rebuilt in our own factory. Guaranteed to be in perfect condition. Try for 5 days at our expense. Write today for this Special Offer. A postcard will do. Send now!

WYNN TYPEWRITER EXCHANGE, 7 Reliance Bldg., Kansas City, Mo.



Actual photo
of one of
our rebuilt
Underwood
Typewriters.



\$3 DOWN And It's Yours

Standard Underwood

Rebuilt like new. Every typewriter is factory rebuilt by typewriter experts. New enamel—new stickers—new lettering—new plates—new key caps—new parts wherever needed—making it impossible for you to tell it from a brand new Underwood. An up-to-date machine with reversible ribbon, back spacer, stencil device, automatic ribbon reverse, tabulator, etc. In addition, we furnish FREE waterproof cover and a special Touch Typewriter Instruction Book. You can learn to operate the Underwood in one day.

From factory to you

Yes, only \$3 brings you this genuine Rebuilt Standard Visible Writing Underwood direct from our factory, and then only small monthly payments while you are using it makes it yours; or, if convenient pay cash. Either way, there is a big, very much worth-while saving, too. Genuine new Underwood parts wherever the wear comes

—genuine standard four row, single shift keyboard—thoroughly tested—guaranteed for 5 years.

\$3 Puts It in Your Home

You don't even have to scrimp and save to pay cash. Instead, you pay only a little each month in amounts so conveniently small that you will hardly notice them, while all the time you are paying.

you will be enjoying the use of and the profits from the machine.

10 Days' Free Trial

Remember, you don't even have to buy the machine until you get it and have used it on 10 days' free trial so that you can see for yourself how new it is and how well it writes. You must be satisfied or else the entire transaction will not cost you a single penny.

Typewriter Emporium Shipman-Ward Mfg. Co.

2121 Shipman Bldg., Montrose and
Ravenwood Aves., Chicago, Ill.



All shipments made direct to you from our big modern factory (shown above)—the largest typewriter rebuilding plant in the world.

Use Coupon

Now is the time when every dollar saved counts. Let us save you many dollars. Don't delay. Get this wonderful easy payment bargain offer now, so you can send for and be sure of getting your Underwood at a big saving—and our easy terms or for cash.

**Act Now—
Send Coupon Today!**

FREE TRIAL COUPON

Typewriter Emporium Shipman-Ward Mfg. Co.

2121 Shipman Bldg., Montrose and
Ravenwood Avenues, Chicago, Illinois

Send by post or mail Bargain Offer No. 2121 of a Standard Visible Writing Underwood. This is not an order and does not obligate me to buy.

Name.....

Street.....
R. F. D. No.....

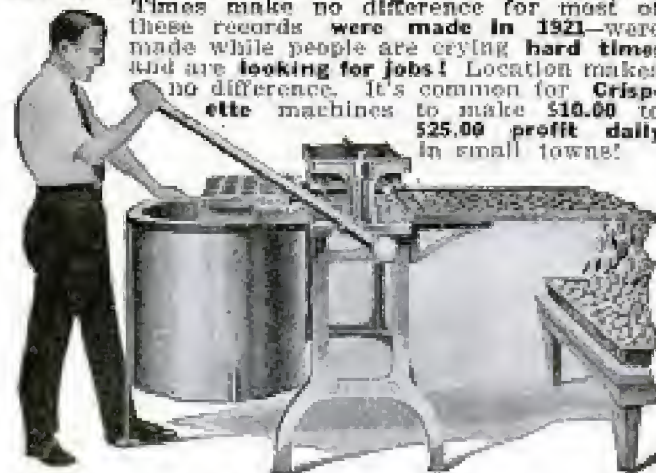
Post Office..... State.....

\$375.75 One Day!

Ira Shook, of Flint, Did That Amount of Business in 1 Day

—making and selling **Popcorn Crispettes** with this machine. He says in letter dated March 1, 1921: "I started out with nothing, now have \$12,000.00 all made from **Crispettes**." Others have amazing records: Gibbs says: "Sold \$50.00 first night!" Erwin's little boy makes \$35.00 to \$50.00 every Saturday afternoon. Melxner reports \$600.00 business in one day. Kellogg writes: "\$700.00 ahead first two weeks." Master's letter says: "—sold \$40.00 in four hours." During March, 1921, Turner was offered \$700.00 clear profit above cost of his investment to sell. **There is money—lots of money—in Crispettes.**

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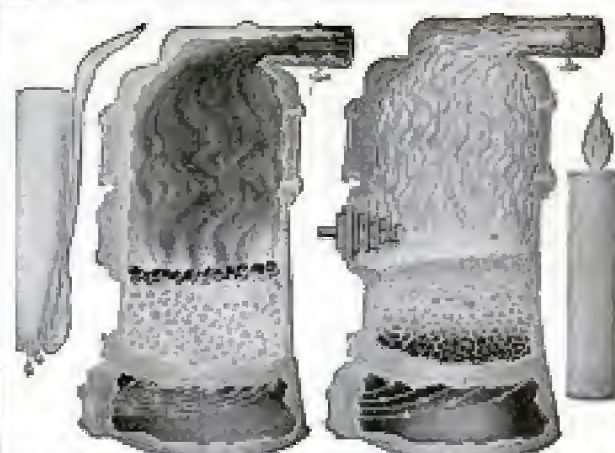
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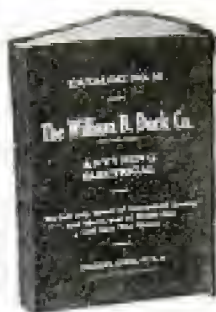
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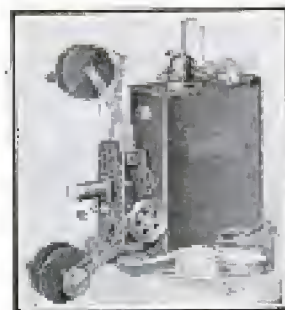
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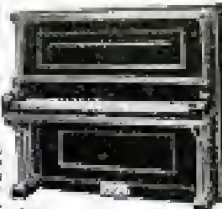
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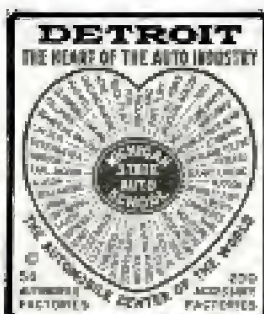
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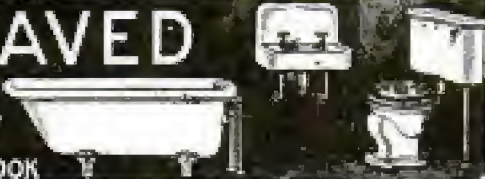
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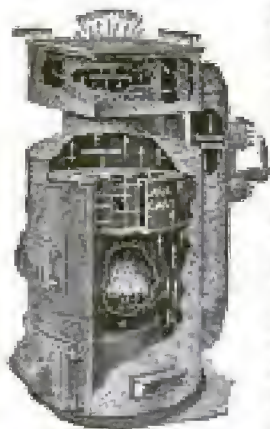
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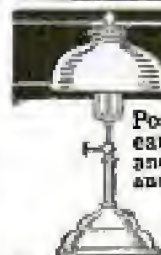


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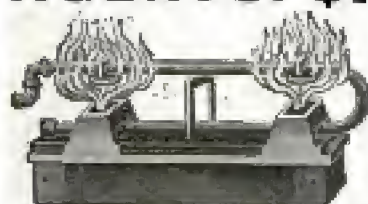


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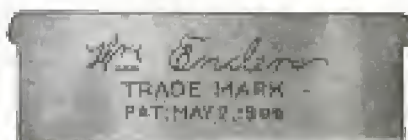
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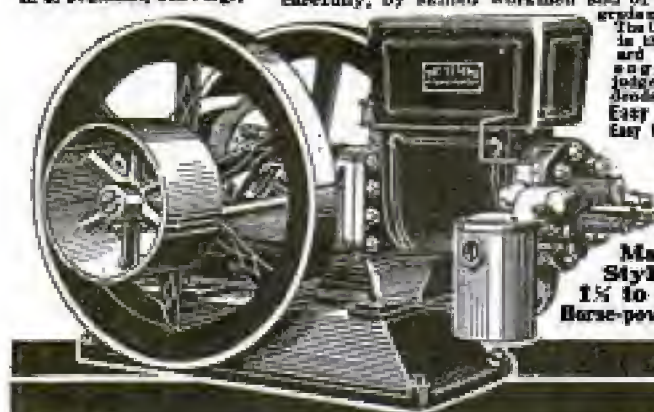
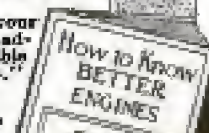
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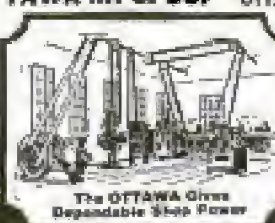
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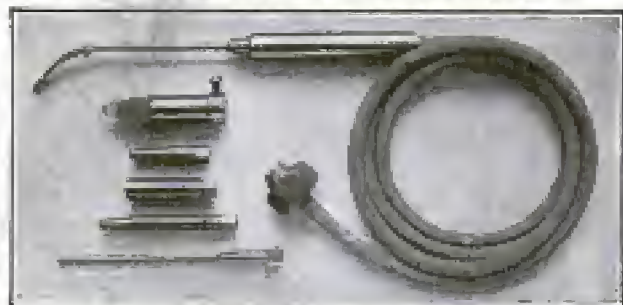
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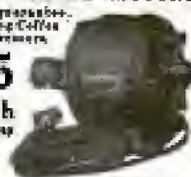
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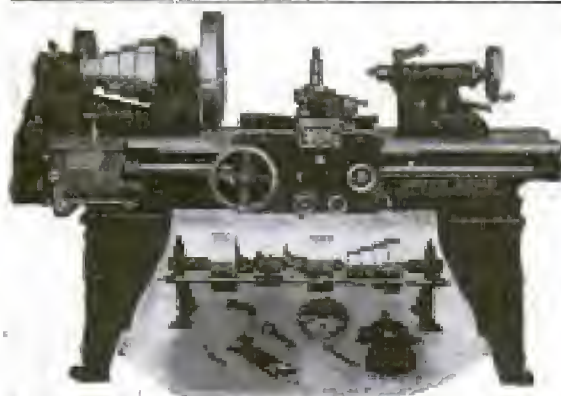


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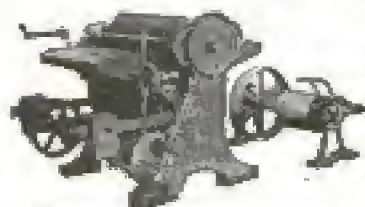
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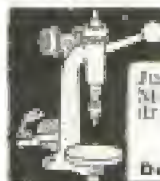
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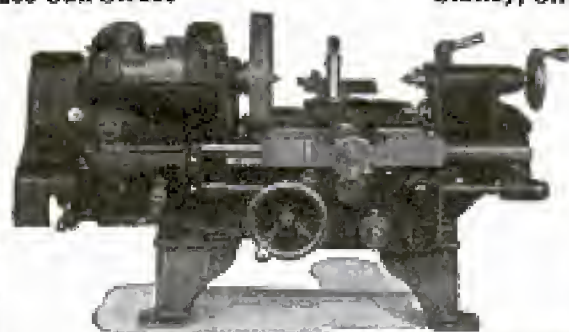
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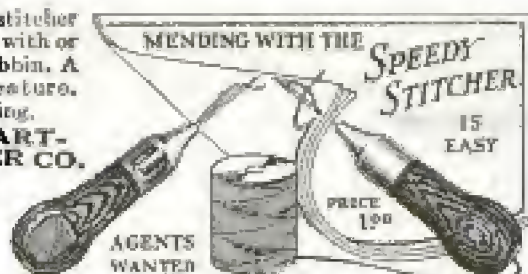
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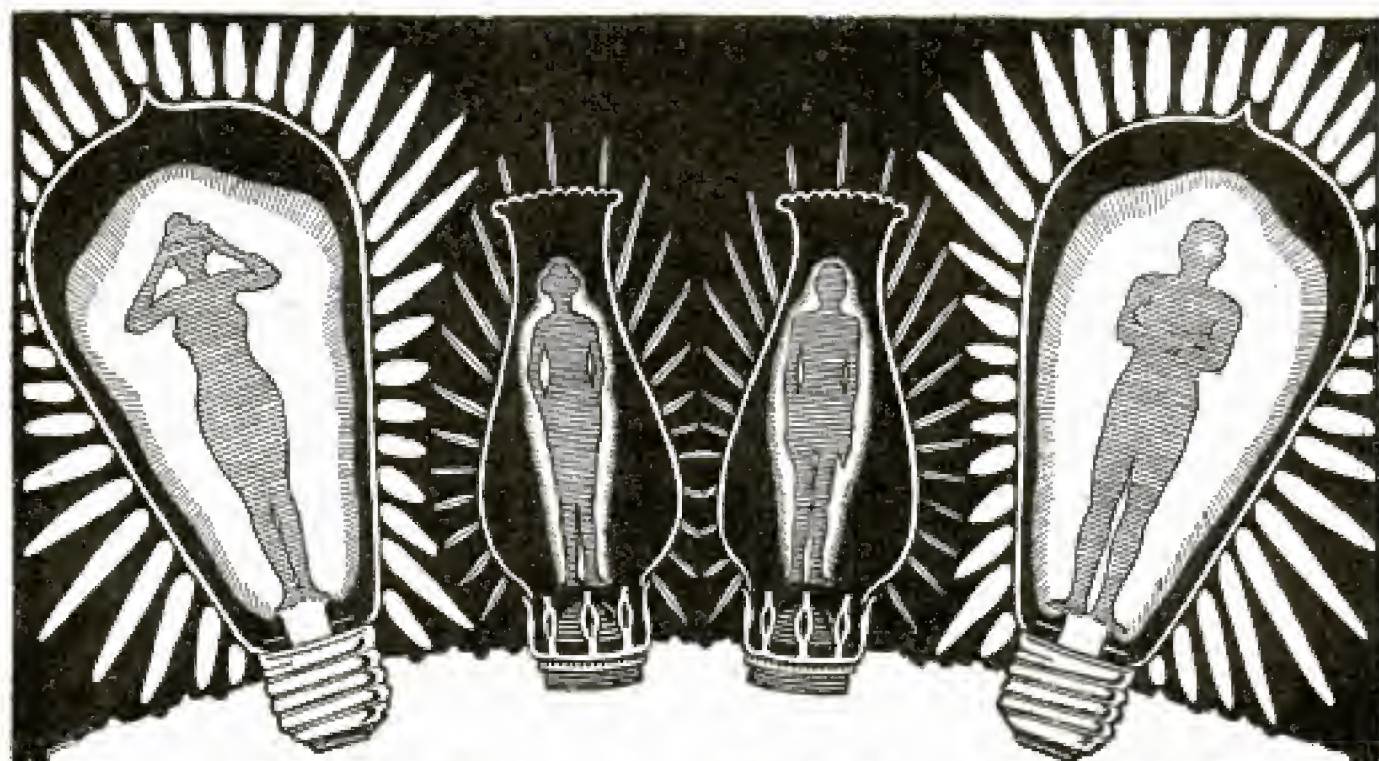
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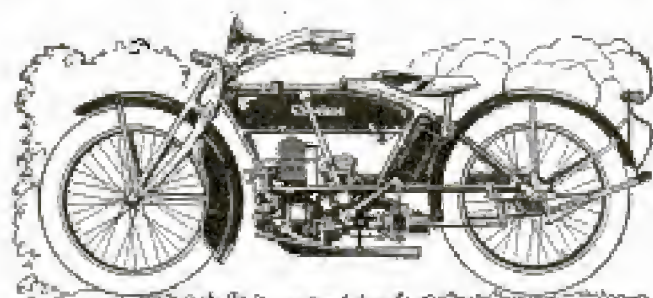


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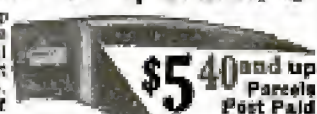
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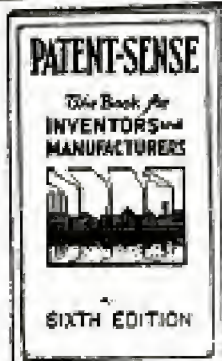
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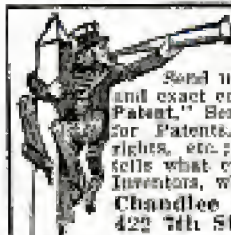
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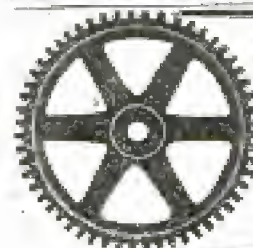
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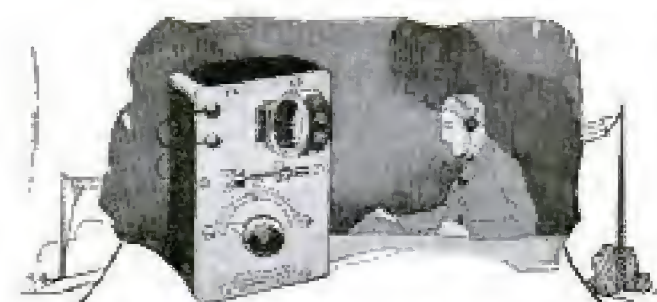
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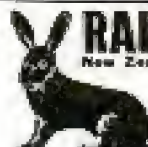
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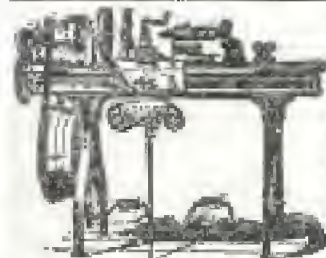
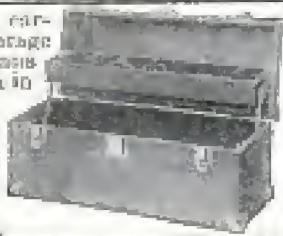
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Easy to put on. We furnish instructions. We tender cash recoveries for all cases and guarantee them to \$5. Ford Roadster, \$5.50; Touring, \$6.95; other cars, \$12.95 to \$18.00. Delivered at your door. Best economy \$5.50 up.

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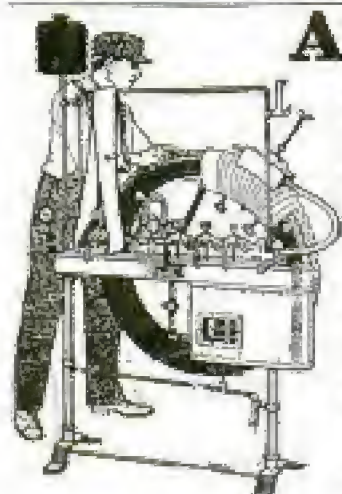
Will do as much and as perfect work as the big \$250 to \$500 vulcanizing outfits. A boy can vulcanize perfectly with this simple machine. It's the only vulcanizer that has Automatic Heat Control. It must vulcanize just right. It can't undercure or overcure a tire. Requires no watching or regulating. You can learn to do expert tire vulcanizing in half an hour with the Shaler.

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SURE-START VAPORIZER DOES IT!

Slightest spark ignites. It's fully guaranteed. Absolutely safe. Makes starting sure on coldest day. Saves battery. Saves gas. Saves temper. Saves time. It's a marvelous invention. Motorists wild about. Write for name of nearest dealer.

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Sell right and left in your town. \$15 to \$20 day easy. Exclusive Territory. Easily attached. Take out drain cock and insert vaporizer—that's all. Get our proposition.

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SHOOTS 22-calibre cartridges.

Automatic safety.

Large, keen blade, made of best

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Prevents Broken Arms—Cranking Accidents.

Make big money, part or full time. Burnett sold 144 in two weeks—made \$218. Big Field—our folder, "How to Make Money With Non-Kick Device," will prove it. Almost 5,000,000 old Fords without starters. 70% 1921 Fords sold without starters, or 875,000 out of 1,250,000.

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Here's the ideal garment for every man whose work or hobby necessitates the protection of his ordinary clothing. Whether you wear it all day, or just put it on for a few minutes you can't beat it for speed in putting it on and taking it off, or for its thorough protection when fastened.

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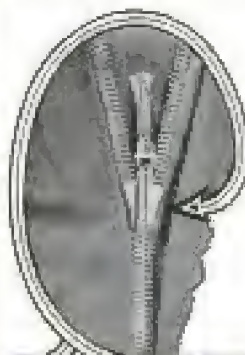
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It Is Rust-Proof, Dust-Proof and Scratchless

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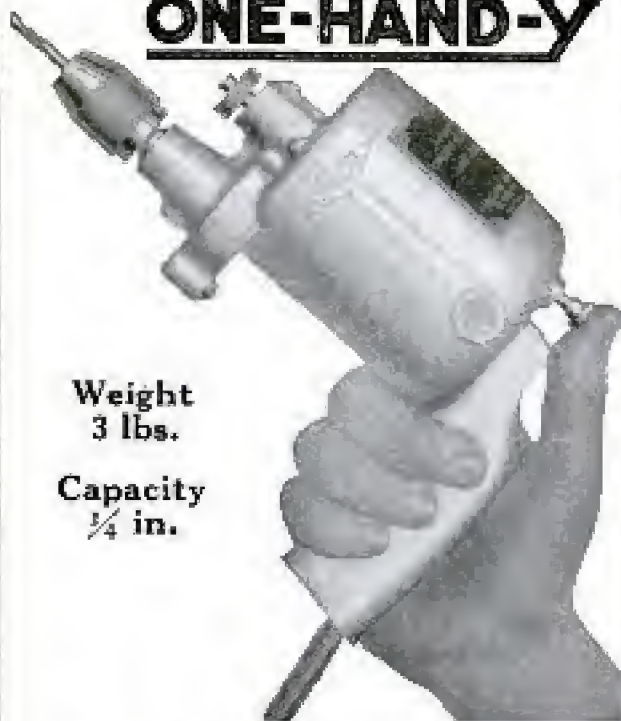
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Capacity
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The ease with which holes may be drilled in metal or wood with the ONE-HAND-Y makes it one of the most desirable tools in existence.

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The inventor, L. D. Johnson, 609 W. Lake St., Chicago, is offering to send a lamp on 10 days' FREE trial, or even to give one FREE to the first user in each locality who will help him introduce it. Write him today for full particulars. Also ask him to explain how you can get the agency, and without experience or money make \$250 to \$500 per month.

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the
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Without
Pedaling

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Send for complete literature illustrating and describing SHAW Attachments and SHAW Motorbicycles. Use the Coupon. Send today.

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Write for free copy of Starrett Catalog No. 22 "AP" describing and illustrating 2100 Fine Tools

The L. S. Starrett Company

The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled

Athol, Mass.

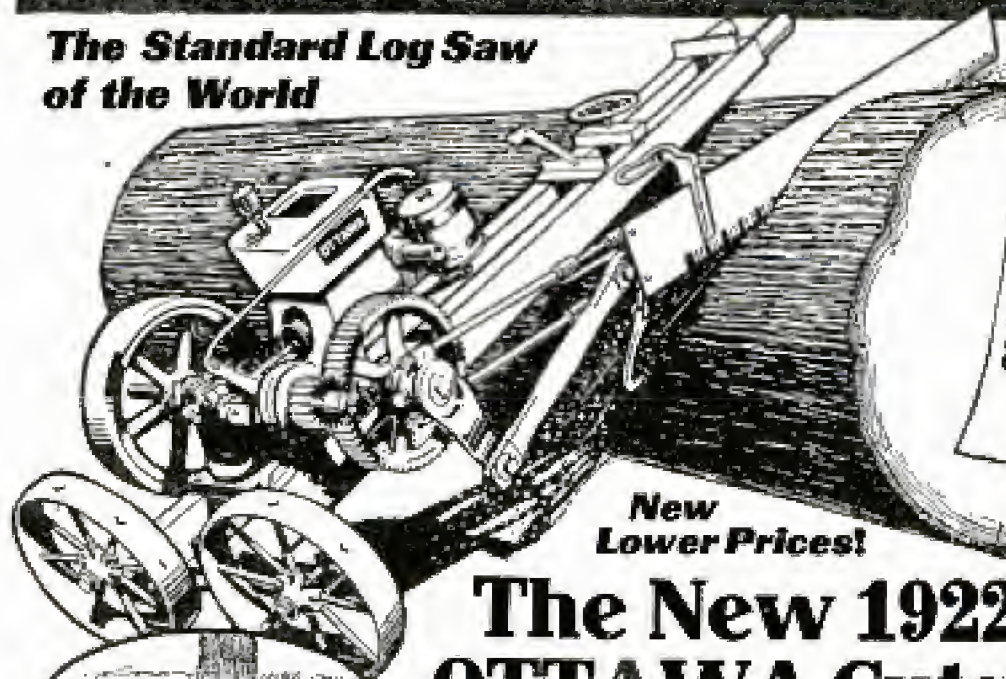
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Use Starrett Tools

Cuts 36 Cords a Day With His OTTAWA LOG SAW

The Standard Log Saw of the World



READ THIS

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Sept. 29, 1922

Gentlemen:
Our Ottawa Log Saw certainly works fine. I saw 36 cords a day with the Ottawa and never have any trouble.

Will start sawing again this week. It is no work at all with our fast-cutting Ottawa.

Your friend,
FELIX MARTINS

New Lower Prices!

The New 1922 Model OTTAWA Cuts Faster

MR. MARTINS' report is the best proof I can offer to make good the claim that the OTTAWA Log Saw is the Fastest-Cutting One-Man Outfit ever made. And the 1922 Model is still faster! As for making money with the OTTAWA—T. O. Shurson, Eagle Grove, Ia., banked \$255.25 extra in two months. These men have the older model. The New OTTAWA does more work quicker.

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Easiest to Move The OTTAWA is acknowledged the only real One-Man Log Saw because it is the easiest moved and operated by one man. The New 1922 Model is even more convenient to handle.

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NAME

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Quick change to Tree Saw and back to Log Saw.



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Limb or Buzz Saw sold alone or with Log Saw.

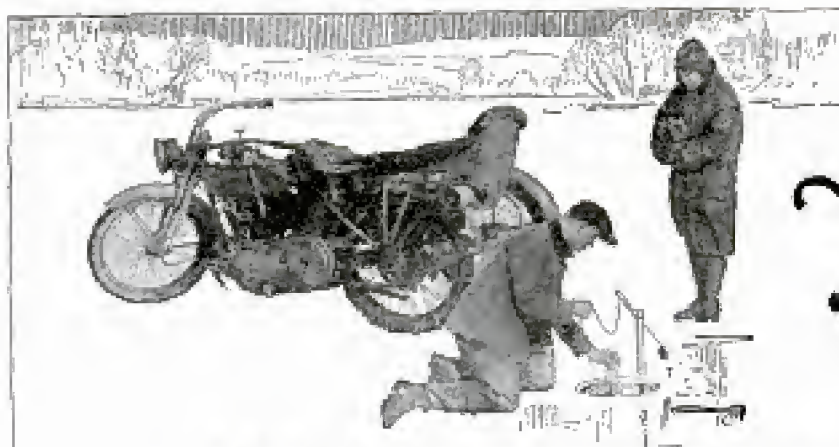
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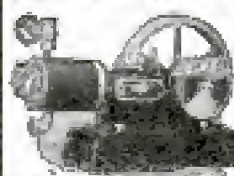


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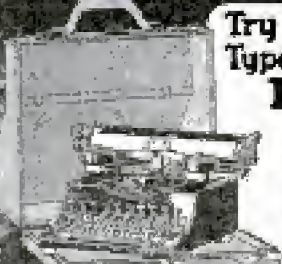
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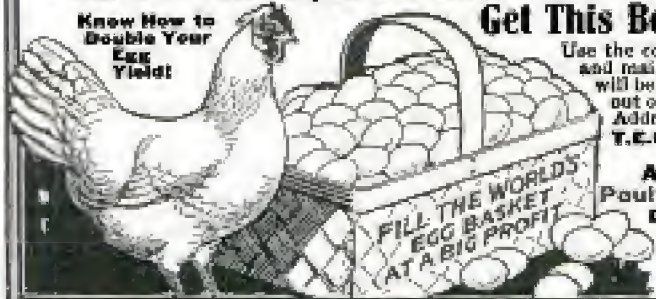
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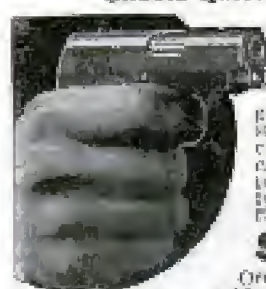
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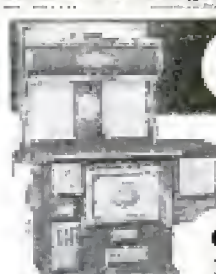
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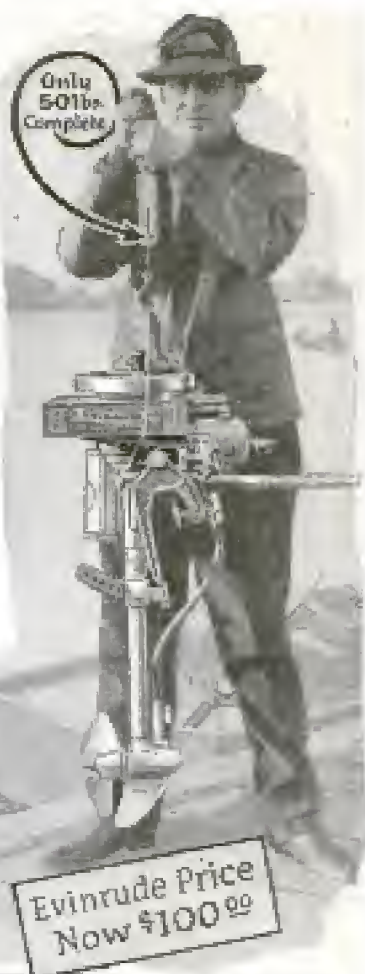
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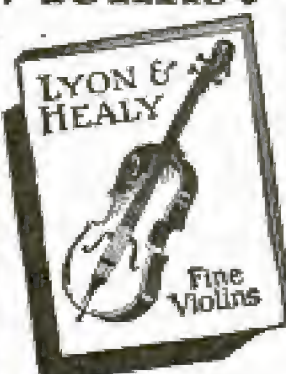
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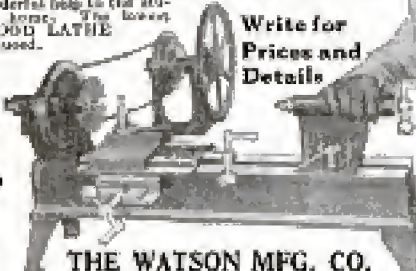
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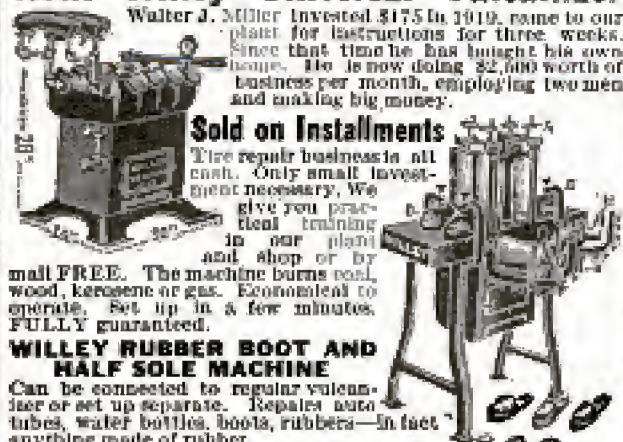
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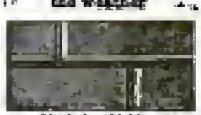
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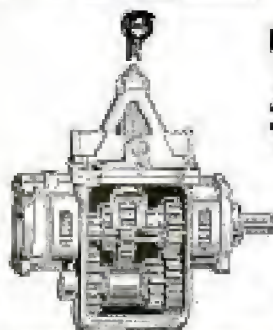
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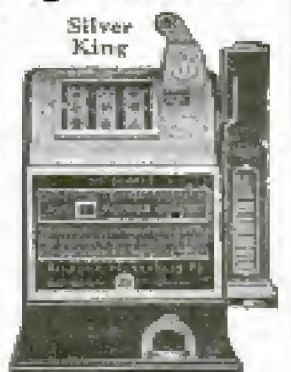
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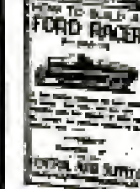
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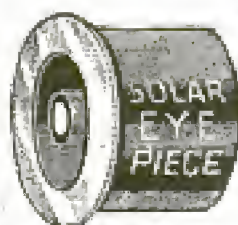
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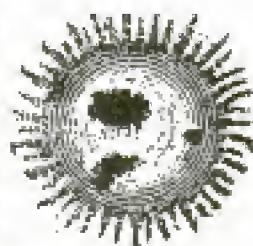
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30x3 1/2	7.00	12.50	32x4 3/4	13.00	21.45
32x3 1/2	9.00	15.45	34x4 1/2	14.45	23.90
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\$215⁰⁰ In One Day

New Invention Sweeping Country Like Wildfire!

NO wonder this amazing new invention is bringing fortunes to agents. All over the whole country this new device is doing away with old-fashioned methods of heating with coal stoves, ranges and furnaces. Already over \$1,000,000 worth have been sold.

You can readily understand why this new invention—the Oliver Oil-Gas Burner—is sweeping over the country like wildfire. It does away with all the expense of coal—making every stove a modern oil-gas burner. Saves money, time and drudgery. Three times the heat of any other method. No wonder agents are riding in on the tide of big Oliver profits!

These men know the secret of big money. They know a good thing when they see it and they know that the time is ripe for this new Oliver improved Oil-Gas Burner. They know that this age of high-priced coal and wood makes it necessary for some substitute. They see ships and locomotives being run by oil and big buildings being heated by it. And they know that

an invention that makes use of this cheap fuel for every home—and yet does it so as to give more heat than coal or wood—is the thing they want to tie up to.

AGENTS Are Making Fortunes

Big Profits Quickly Made

You too can use this secret of big money. You do not need to be a high-powered salesman. The Oliver's amazing features sell it for you. When people see it they know at once that it is the thing they want. You will realize that this is a proposition that will pay you as big money as it does others. We have a definite number of open territories which we are ready to dispose of to those who act quickly. Every territory allotted is filled with big-money opportunities. And this big money comes easily. Because not only does this invention practically sell itself on sight but when you have sold **one** this one will sell several others as soon as your customer's friends and neighbors see it. And thru our special plan you get credit and commissions for every sale in your territory.

You can also make big money just by using your spare time. Note how N. B. Chelan made \$43 in one evening.

Coupon Brings Full Offer

If you want to make at least \$5,000 a year easily, mail this coupon now for our offer. We are not making any extravagant claims about this. We do not have to. We believe that your common sense will indicate a good proposition to you when you know about it. We want to give you the facts. Won't you write us? And by doing so quickly you will be allotted an exclusive territory with private selling rights.

The coupon will bring you the facts and will save you writing a letter. But mail the coupon at once.

OLIVER OIL-GAS BURNER AND MACHINE CO.
2014-M Pine Street, St. Louis, Mo.

SAYS F. W. Bentley of Philadelphia

"Ye Gods—some fellow I made \$215 today!"

Buys Car with Profits

"Have earned enough in one month to buy me a new motor."
St. W. Knappen, Cal.

\$7 Profit per Hour

"Entered one and made \$21.50 in about 3 hours. The Oliver does the work. It certainly is the real thing."
L. Zanker, Ohio.

"Sells Like Beer in a Dry Town."

"Am sending today for 7 Oliver. This is one day's orders (\$84 profit). Selling like beer in a dry town."
W. H. Drew, Mich.

Mr. T's 28th Order in Six Months

"Ride 51 Oliver 10 No. 20; 6 No. 1; 12 No. 2; 24 No. 4." 1947. It's right on this order alone is \$2115.
G. T. Ottawa, Ont.

Russel Earned \$3300 in Five Months

"Have averaged \$660 profit a month for last six months."
A. M. Russel, Conn.

Carnagey— \$1000 a Month

"Am making \$1000 per month. I have made big money before but did not expect so much. Your Oliver is just the thing."
J. Carnagey, S. D.

Berger— \$258.50 per Week

"Send following weekly hereafter: 10 No. 1; 5 No. 2; 4 No. 3."
H. Berger, Ont.

\$11.75 in Ten Minutes

"I took order for a neighbor, \$11.75 profit in ten minutes."
Mrs. N. B. Bettendorfer, Minn.

\$43 in One Evening

"I made \$43 last night selling Oliver Burners."
N. B. Chelan, Wash.

It Sells Itself

Agents find it no work at all to sell this amazing invention—the Oliver new improved Oil-Gas Burner. They just show it—taking only one minute to connect it—then light it. And the sale is made! This new invention is its own salesman. It sells itself! The Oliver Oil-Gas Burner is the most timely thing that could be put out. It dispenses entirely with coal and wood when both are now high-priced. It burns the cheapest fuel—oil. It saves a woman work now in times when she is looking for just such things. Just as much or as little heat as wanted, off and on instantly by simply turning a valve.

The Secret of Big Money

Of course, now that you know the facts you yourself can understand why this new invention is going over like wildfire! And you can understand why F. W. Bentley made \$215 in one day. Why J. Carnagey made \$1,000 in one month and why hundreds of other agents are cleaning up big too.

Oliver Oil-Gas Burner and Machine Co.

2014-M Pine Street, St. Louis, Mo.

Please send me full facts about how I can make at least \$5,000 a year representing you in my territory. Also your plan if I just wish to make big money in my spare time.

Name.....

Address.....



ENGINE PRICES

All Sizes—2, 3, 4, 6, 8, 12, 16, 22 and 30 H.P.
All Styles—Kerosene, Gasoline or Gas.
Stationary, Portable or Saw-Rigs.

SMASHED

NOW is the time to get your WITTE

Engine—while prices are lower than they have been for years. You need engine power to reduce labor costs, do more and earn more. Tell me what you want, Engine, Power Saw, Buzz Saw, Log Saw or Tree Saw, and I will send you special information, catalog, and lowest direct-from-factory price. To give an idea how low prices are, this

WITTE

2 H-P Engine

\$39.95 F.O.B. K.C.

From Pittsburgh, 45 More.

Here is a chance to get your power plant, any size, up to 30 H.P., at a big saving. I can make immediate shipment, guarantee safe delivery. Engine shown is shipped on skids, ready to operate. Easy to set and use. Easy to buy now.

Liberty Bonds Same as Cash

If you are short of cash, I will take your Liberty Bonds—any issue—full face value, or I will sell you on easy terms at the regular payment price, if you wish terms.

90-DAY TEST—Lifetime

Guarantee All WITTE Engines, Saw Outfits, Log and Tree Saws sold on 90-Day Test and Life Guarantee against defects.



Write For Engine Catalog No. 49—FREE

It tells about Stationary and Portable Engines, or if you want to know about Saw Outfits, write for Saw Catalog No. 17.

WITTE ENGINE WORKS,

1743 Oakland Avenue,
1743 Empire Building,

Kansas City, Mo.
Pittsburgh, Pa.

"The War IS Over"

Special FREE Offer



WITTE

Latest Out Log Saws
Run Steady—Cut Faster.
Shipped Complete—Engine
and Saw as Shown—Ready to Use.

For a Short Time Only

We will include regular \$35 Tree Saw equipment
FREE with every WITTE Log Saw.

You Get Both for Only

\$99.50 F.O.B. K.C.

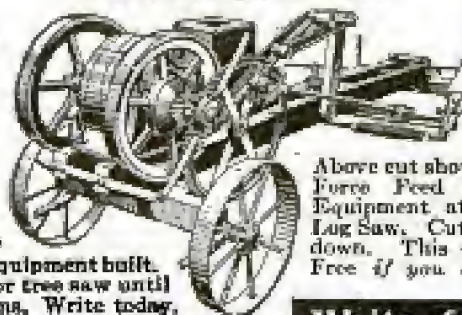
From Pittsburgh, \$6.00 more.

90-DAY TEST—Lifetime Guarantee

The WITTE Log Saw is a Big Capacity, strongly built outfit—Easy to operate. Runs all day on 2 gallons of fuel. Positive Lever Control. Start or stop saw while engine runs. Only Arm Swing Log Saw with Interchangeable Tree Saw Parts. Makes Log Saw a fast-cutting Tree Saw as shown. Change in 5 minutes. Clamps to tree below saw in 10 seconds. Most practical—lightest—easiest to use treesaw equipment built. Big 3-color catalog tells all about it—Free. Don't buy any log or tree saw until you know about the WITTE. Sold direct—Cash or Easy Terms. Write today.

WITTE ENGINE WORKS

1743 Oakland Ave., Kansas City, Mo. 1743 Empire Bldg., Pittsburgh, Pa.



Above cut shows WITTE Force Feed Tree Saw Equipment attached to Log Saw. Cuts tree clear down. This equipment Free if you order now.

Write for big Log and Tree Saw Catalog Free



His Letter—

"It has been about eight years ago since I flew into Chicago, more or less broke, but with a strong determination to learn the automobile business. I dropped in at the office of Greer College. You took me in and in about ten weeks I had a practical working knowledge of automobiles that has since been the means of making me a successful automobile man. I am just 40, but have made enough that I will retire from business and spend the rest of my life just taking things easy. Greer College was at the bottom of my success. In less than 10 years, I have done better than many men do in an entire lifetime. I had no special advantages not possessed by other men. Every student who enters Greer College has the same chance that I had, and today the chances are even better than when I began. I consider Greer College the best school of its kind in the country—bar none. As you know, I have sent you a great many students and there are more coming. I am proud of my school and never pass up an opportunity to do it a good turn."

E. M. HAGAR.

Broke! -Then Enters Big-Money Field That Soon Enables Him to Retire

How Would You Like to Retire in Just a Few Years from Now? The Actual Story of E. M. Hagar (as told in the letter above) Points a Way for You to Make Big Money Quickly Too. Let Us Tell You About It.

"Have made enough and will retire from business and will spend the rest of my life just taking things easy."

Surely E. M. Hagar from a town in Illinois was not a man to stand by while a business was expanding by leaps and bounds. Just a few years ago he knew that one person out of every fifty had a car—then one out of every thirty—then one out of every twenty! And still the amazing growth continued. One out of every fifteen, ten, nine and eight! And finally he saw the time when one person out of every seven in the United States owned an automobile.

Were those merely statistics to him? Did he just whistle at the amazing story that they told? No! He said to himself, "If one out of every seven people in this country owns a car, then there's big money—millions of it—going to be spent in keeping them up. And I'm going to get my share!" And, as you know, he did, quick!

How Much of Those Millions for You?

E. M. Hagar made his pile. How about you? There's plenty more waiting. The automobile business is here to stay—and to grow even bigger. More than 3½ million automobiles were made in 1920. What's your share going to be of the millions that will be spent in keeping these cars working and looking right?

You know how our American folks are. They're proud of their cars. They want them always to be good to look at—and good to drive. They want these things and they'll pay for them, and pay well. You can be the man to do what they want done right. This big-money field is waiting for you to step into. Trained, thoroughly capable men are needed everywhere.

Greer College of Automotive Engineering,
2014 Wabash Ave., Chicago.

Please tell me all about the automobile business and how I can make big money in it too. And send me your 64-page book, "How to Succeed in the Automobile Business" also.

Name.....
Address.....

Ask a dozen experts—men who know—and you would get the same answer: "The expansion of the automobile business has only just started!" Now, in justice to yourself, can you stand by while big automobile profits are just pouring into the laps of others?

Why Not Move On to Easy Street?

Get your share. Learn the automobile business thoroughly from A to Z. Learn how to give the automobile owner the kind of service he is glad to pay good money for. Learn, then, a fascinatingly interesting new way, all about ignition, repairing, overhauling, automotive electricity and mechanics—and how to establish your own automobile business. Be an Automotive Engineer. Then in a short time you can do as Mr. Hagar did—Move On to Easy Street!

Your Own Eyes Give You Proof

Look around you. What do you see? Automobiles, Auto Trucks, and Tractors by the thousands. Your own eyes give you daily proof of the big money you can make. In every city, town and village, good automobile experts are needed. Big money is paid—and paid gladly. Nothing is to be made by merely wondering who is getting the big profits for keeping them in shape. Step in and get your share! Don't fail to write to this school that will do as much for you as it did for Mr. Hagar of Illinois!

Don't Detour—Send for This Free Book

All your life you've wanted to come to Chicago! This is your chance. Come to Chicago—and at the same time learn the automobile business thoroughly from the ground up. Greer College will teach you to repair and make every part pertaining to the automobile, truck and tractor. We teach you by actual practice.

Don't detour! Send for the book of the oldest automobile school in America—the school that started with the automobile in 1902 and is abreast of its development in 1922. Write today.

GREER COLLEGE
of Automotive Engineering
2014 Wabash Ave., Chicago, Ill.



11 Reasons Why Greer Brings You Big Money as Automotive Engineer

1. Greer College—the pioneer automobile school—bore with the automobile in 1902 and has grown and developed step by step right with it.
2. Thorough equipment covers every possible branch of the automobile, truck, tractor, and airplane business.
3. Special method of instruction qualifies you thoroughly in shortest possible time—you learn by doing, not merely by being shown.
4. Full staff of experienced automotive experts give you their personal attention and instruction.
5. Our service in finding you a job. The Greer College has never failed to place any competent student who wanted work.
6. No cut-and-dried, machine-like instruction. We do not turn out "cremated" as a factory would run out bolts. Our instruction is personal, individual, and based on the needs of each single student.
7. Greer Diploma given to graduates is recognized in the automobile industry as unquestioned evidence of its holder's ability.
8. Our location in Chicago, America's second largest city. Not only a pleasant and interesting place for you to get your training but also keeps you in touch with the big activities in the automobile business.
9. Greer College occupies the entire new building planned above containing floor area of 100,000 square feet—located right in the heart of the automobile district of Chicago.
10. 20,000 Greer Graduates. And every one thoroughly, carefully, individually trained—just as we will train you.
11. Money-Back Guarantee. We absolutely guarantee to fulfill every promise made to the prospective student or to refund the money paid without question or delay.



Brings HARTMAN'S Richly Upholstered 7-Piece Suite

Quarter-Sawn and Solid Oak
Send only \$1 for this complete suite
of library, parlor, or living room fur-
niture. Use it 30 days on Free Trial.

If you don't say that it is even more than you expected,
ship it back and we return your \$1 and pay transportation
charges both ways.

A Full Year to Pay

Only by seeing this splendid quarter-sawn and solid oak suite can you realize how it will add to the appearance of your home. Only by examining it can you appreciate what a record-breaking bargain it is at our amazing price. Furniture like this can be bought nowhere else at near our price. **Handsome Fumed Finish!** TABLE, solid oak with top 24x36 in. ARM ROCKER, solid oak with quarter-sawn top panel and rounded arm rests; seat 18x19 in. SIDE ROCKER, solid oak with quarter-sawn oak top rail, seat 18x14 in. ARM CHAIR, 37 in. high and SIDE CHAIR, 34 in. high, with seat 16x14 in. Table and chairs stand on noiseless glides. Ornamented backs and seats upholstered in durable, imitation Spanish brown leather. Comfortable spring seats. TABOURETTE, 14½ in. high with 10 in. top, is solid oak. BOOK BLOCKS, heavy enough to support a liberal number of volumes. Shipped fully boxed, "knocked down" to lessen freight charges) from factory in Central Indiana, Western N. Y. State or Chicago warehouse.

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Send \$1.00 now. Pay balance \$3.00 per month.

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est price smashing bargains.
Everything you need in Furniture, rugs, linoleum, stoves,
watches, silverware, dishes, washing machines, sewing
machines, aluminum ware, phonographs, gas
engines, cream separators, etc.—all sold
on our easy monthly payment plan and
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Post card or letter brings this
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"Let Hartman Feather YOUR Nest"

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Chicago

368-Page Book
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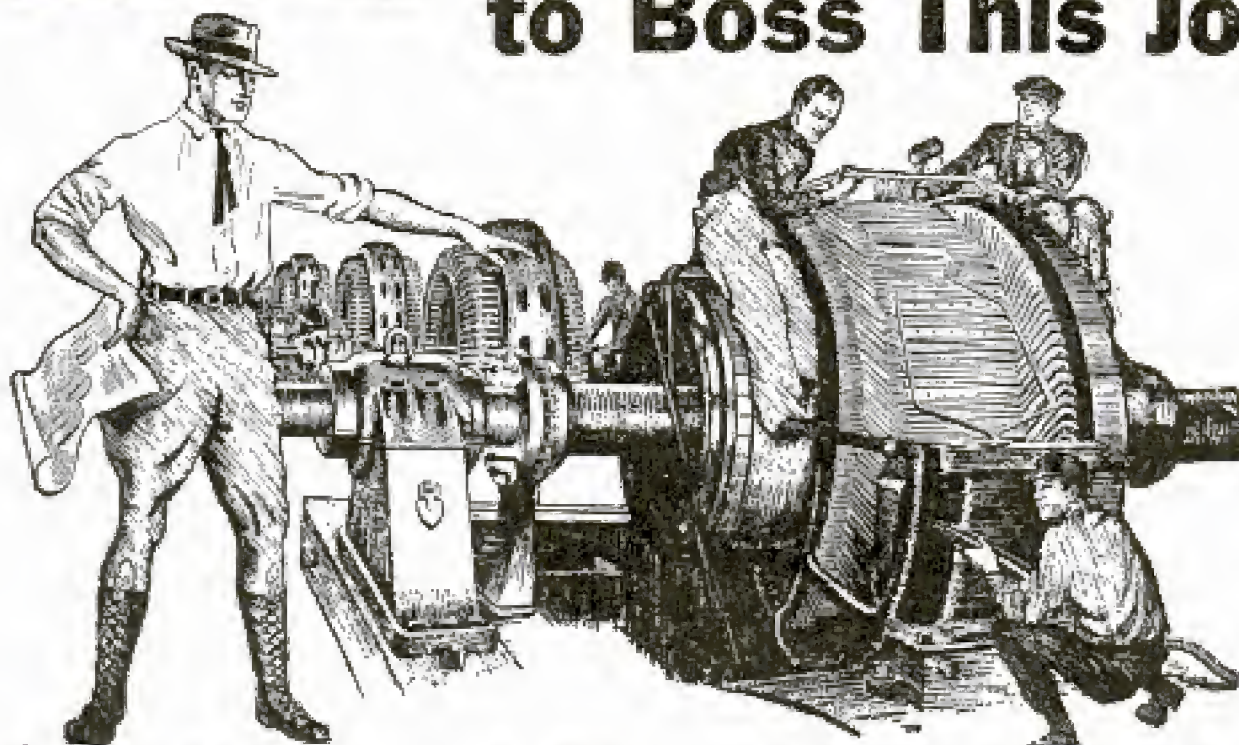
HARTMAN Furniture & Carpet Co.
Dept. 4152 Chicago, Illinois
Enclosed find \$1.00. Send the 7-piece Living
Room Suite No. 112DMA7 as described. I am
to have 30 days' free trial. If not satisfied,
will ship it back and you will refund my \$1.00
and pay transportation charges both ways.
If I keep it, I will pay \$3.00 per month until
the full price, \$37.95, is paid. Title remains
with you until final payment is made.

Name.....
Street Address.....
R. F. D.....Box No.....
Town.....State.....
State Year.....
Occupation.....Color.....

Upholstered
Backs and Seats
Comfortable
Spring Seats



YOU TOO Can Learn to Boss This Job



"Electrical Experts" Earn \$12 to \$30 a Day **WHAT'S YOUR FUTURE?**

Today you are probably earning \$3, or \$4, or \$5 a day—\$18 to \$30 a week. In the same six days, as an "Electrical Expert," you can make from \$75 to \$200 a week, and make it easier—not work half so hard.

Why, then, remain in the "small pay" game—in a line of work that offers **no Big Promotions—no Big Income—no Big Future?**

Fit Yourself for a REAL Job—Be an "Electrical Expert!"

Today even the ordinary electrician—the "screw driver" kind—is making money—big money. But it's the "trained man"—the man who knows the **whys** and **wherefores** of Electricity—the "Electrical Expert"—who is picked out to "boss" ordinary electricians—to "boss" the big jobs—the jobs that pay.

\$3,500 to \$10,000 a Year

You don't have to work for less. Enroll **NOW** for my easily-learned, quickly-grasped, right-up-to-the-minute, spare-time, Home-Study Course in Practical Electricity. It's the **Short Cut to Success—To Big Pay.**

Age or Lack of Experience No Draw-Back

You don't have to be a College Man; you don't have to be a High School graduate. My Course in Electricity is the most simple, thorough, and successful in existence, and offers every man, regardless of age, education, or previous experience, the chance to become, in a very short time, an "Electrical Expert," able to make from \$75 to \$200 a week.

EARN AS YOU LEARN

Don't let money matters worry you. My terms are easy—And with me, you **Earn as You Learn**—and have money to spare. Some of my students are averaging as much as \$25 a week in spare-time electrical work.

"Money Back" Guarantee

Under Bond, I positively guarantee to return every penny paid me, if you are not entirely satisfied with my instruction. And back of me, in my guarantee, stands the Chicago Engineering Works, Inc., a Million Dollar Institution.

L. L. Cooke, Chief Engineer,
Chicago Engineering Works, Inc.
Dept. 11-A, 2154 Lawrence Ave., Chicago, Ill.

Dear Sir: Send me at once full particulars of your Free Outfit and Home Study Course; also Free Booklet on "How to Become an Electrical Expert." No obligation on my part.

Name.....

Address.....

FREE—Electrical Outfit—FREE

After the first few lessons with me you start right in to **WORK AT YOUR PROFESSION** in a practical way. For this you need apparatus and I give it to you, **ABSOLUTELY FREE.** This complete set of equipment also helps you to make money doing Electrical jobs on the side.

WRITE ME—MAIL COUPON TODAY

Success in the Electrical field is sure—you can't fail if you are a trained man. Use Coupon below and get the Vital Facts, and my Free booklet, "How to Become an Electrical Expert." Don't hesitate—**DO IT NOW.** MAIL THE COUPON TODAY.

L. L. COOKE, Chief Engineer

CHICAGO ENGINEERING WORKS

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Dept. 11-A, 2154 Lawrence Avenue, Chicago, Ill.

The "Cooke" Trained Man is the "Big Pay" Man



Rahe's

Complete **AUTO AND TRACTOR** Training Course

REDUCED FROM \$150 to \$100



If You Are Not Earning
What You Should—Come to

RAHE

I want to be frank and plain. If you are making \$400 a month or more, and like your work, stick to it. That is always my advice to men who already are making big pay. But if you are \$100 a month, and are making only \$100 to \$300, you'd better break away NOW or you never will. BREAK AWAY from LOW PAY, UNRELIABLE WORK, NO FUTURE. Fill out the Coupon today. This is the greatest offer I ever made to AMBITIOUS MEN.

AMBITIOUS MEN—Here is the greatest offer I ever made. For immediate acceptance, a complete Rahe Life Scholarship, reduced from \$150 to \$100. If you **ACT NOW** you can **SAVE \$50** (enough to pay your railway fare and leave you money for room and board). Think of it—three great schools to choose from—Chicago, Kansas City and Cincinnati—each one of them a complete automotive training institution teaching students the famous **RAHE-WAY**. Most complete training I have ever offered. Was \$150. Now only \$100—

And I add this Ironclad Guarantee:

7 days free (SEE INSIDE FRONT COVER)

The **RAHE-WAY** is Guaranteed. We must be satisfied we can train you. So must you. Come now under this famous Rahe 7-Day Guarantee. You take no chance when you buy guaranteed clothing or food. And you take no chance here—the Rahe Auto and Tractor Training Course is **GUARANTEED**.

No need to delay a minute. You know my tuition rate and my course is *guaranteed*, so **COME NOW**.

Office Men, Clerks, Mechanics, Farmers! Three Billion Dollars will be spent this year for automobile upkeep alone. Millions more for Tractor and Aviation. \$3,000,000,000—and a part of it can be yours. A big part, too, for **RAHE-Trained** men are in demand, and receive big money.

Become An Auto or Tractor Expert

If you have been undecided, if you have put off coming, if you lacked the \$150—break away NOW. Come to a **RAHE School**. Come—prepare for Big-Pay Positions—Independence, **PROSPERITY**. Send for Catalog **TODAY**.

HENRY J. RAHE Dept. 2897

Three Big Schools

CHICAGO, ILL. **KANSAS CITY, MO.** **CINCINNATI, O.**
Ontario and Michigan Blvd. 224 and Oak Sts. 3th & Walnut Sts.



FREE! Use attached coupon, or just a post card will do, and get my 68-page Catalog. Sent free to you. Let me prove the big opportunities open to you. Get all particulars **FREE**. Send Today—**NOW!**



Mail This Coupon Now!

Send this coupon today for my fine 68-page Catalog showing graduates success and opportunities now open. (Address nearest School.)

2897

Name.....

Address.....

Age..... Occupation.....

JOHNSON'S WOOD DYE



How to Finish Woodwork

The finishing of woodwork—old or new, is just a matter of using the proper materials. The Johnson Line of Artistic Wood Finishes is complete—it includes Johnson's Wood Dye, Perfectone Enamel and Undercoat, Varnishes, Prepared Wax, Paste Wood Filler, Crack Filler and everything necessary for woodwork, floors and furniture.

Johnson's Wood Dye is the proper material to use for staining wood—old or new—soft or hard. For the popular enamel finish on either new or hard work use Johnson's Perfectone Undercoat and Enamel. Made in White, Ivory and French Gray.

For refinishing old woodwork, floors and furniture in color where you do not care to go to the trouble or expense of removing the old finish, apply one coat of Johnson's Sani-Spar Varnish Stain. Made in four beautiful shades.

This Book on
Home Beautifying

Free!

This book gives complete instructions for finishing all wood—hard or soft, old or new. Tells how inexpensive soft woods may be finished so they are as beautiful and artistic as hardwood. Explains just what materials to use and how to apply them. Includes color card—gives covering capacities, etc. Use coupon.

S. C. Johnson & Son, Dept. PA 1, Racine, Wis.

Please send me, free and postpaid, your Instruction Book on Wood Finishing and Home Beautifying.

NAME.....

ADDRESS.....

CITY & STATE.....

Dealer's Name.....

Are You Building?

If so, you will find our book particularly interesting and useful. It will tell you how to do the work yourself or enable you to talk intelligently on the subject to your architect and contractor. Our Individual Advice Department will give a prompt and expert answer to all questions on interior wood finishing—without cost or obligation.

S. C. JOHNSON & SON, Dept. PA 1, Racine, Wis.

"The Wood Finishing Authorities"

Canadian Factory—Brantford

This Letter Saved Me Half on a New Typewriter

Chicago, Nov. 2, 1921.

Dear Henry:

I hear that you are down in New York to open a branch office for your firm. You'll be buying a lot of things for the office, not the least important of which will be typewriters.

And that's what I want to talk to you about—typewriters. I want to give you the benefit of an experience I had some time ago, and thereby, I hope, save you some real money.

About a year ago I decided to buy a typewriter for home use. My first thought was to purchase one of the makes we were using in the office, which had been put in before I became buyer for the house. But when it came to digging up a hundred dollars for the machine—I just couldn't. Somehow or other it looked like too much money to me.

Then I thought about picking up a second-hand machine, but the price was about as high, and I had no assurance of service.

I was undecided as to what to do, when one evening at home I ran across an Oliver Typewriter ad in a magazine. I remembered then having read the advertising before and being impressed with the story.

"Why pay \$100 for Any Typewriter"—"When You Can Buy a New Oliver for \$49.50?" read the ad—then it went on to explain how The Oliver Typewriter Company had cut the price by selling direct and eliminating costly selling methods. It was clear to me as an experienced buyer how they could well afford to lop off \$50.50 of the \$100 by their new economical selling plan.

The ad brought out the fact, too, that I could pay \$49.50 cash, or \$55 in easy installments—\$3 after trial and then \$4 per month.

But the thing that decided me was their free trial offer. Without my sending or depositing a penny, they would ship me an Oliver for five days free trial. I could use the typewriter for five days just as if it were my own, and if I wasn't satisfied, all I had to do was to ship it back at the Oliver Company's expense. Well, I mailed in the coupon and got an Oliver for free trial. To make a short story shorter, I was more than pleased with the Oliver. I fully agreed with The Oliver Typewriter Company that if any typewriter was worth \$100 it was this splendid Oliver.

Well, later when we found it necessary to replace some of the typewriters at the office, you may be sure I put in Olivers, saving the company a nice \$50.50 on each. At first the girls were reluctant about changing machines, but after a week or two with the Oliver, they wouldn't have any other.

Naturally now we are all Oliver enthusiasts—that's why I write this letter to you.

You just give the Oliver a trial and you'll be more than willing to buy me a good dinner when I arrive in New York next month.

Yours, J. B.

FREE
TRIAL



Now
\$49.50

That is the letter that saved me \$50.50 on each of my typewriters. I not only equipped the office with the Oliver, but, like my friend, I also bought one for home use. Yes, I am more than willing to buy my friend a good dinner for his valuable advice.

Any reader may order an Oliver direct from this ad by mailing the coupon. No money in advance. No deposit. No obligation to buy. Return or keep the Oliver as you decide after five days free trial. If you decide to keep the typewriter, you can pay cash or you may take over a year to pay at the easy rate of \$4 a month. Mail the coupon today—NOW.

Canadian Price, \$79

The **OLIVER**
Typewriter Company

1091 Oliver Typewriter Bldg.
Chicago, Ill.

Save
\$50.50

THE OLIVER TYPEWRITER COMPANY,
1091 Oliver Typewriter Bldg., Chicago, Ill.

☐ Ship me a new Oliver No. 9 Typewriter for five days' free inspection. If I keep it I will pay \$55 as follows: \$3 at the end of trial period and then at the rate of \$4 per month. The title to remain in you until fully paid for. If I make cash settlement at end of trial period I am to deduct ten per cent and remit to you \$49.50. If I decide not to keep it, I will ship it back at your expense at the end of five days. My shipping point is _____.

☐ Do not send a machine until I order it. Mail me your book—"The High Cost of Typewriters—The Reason and the Remedy," your de luxe catalog and further information.

Name _____
Street Address _____
City _____ State _____
Occupation or Business _____

**A Finer Typewriter at a Fair Price
Over 900,000 Sold**

Williams' ^{PATENTED} Holder Top Shaving Stick

A mechanical problem cleverly solved by the "Holder That Holds"—the Perpetual Stick.

*The threaded
METAL collar
gives the hold*



There is just one sure way to prevent the loosening and wobbling of the stick in the holder resulting from changing climatic conditions.

It is to put a threaded METAL collar on the stick and to screw this into the threaded holder. This gives you METAL to METAL—a dead sure hold. The user is thus freed from all the petty exasperations caused by

the holder that does NOT hold.

See for yourself how neatly this little problem has been solved. Send us 10 cents in stamps for a trial size Holder Top Stick in a large *reloadable box*. The Re-Load makes it the perpetual stick.

As to the soap itself, it yields the Williams' lather.

THE J. B. WILLIAMS COMPANY
GLASTONBURY ^{Copyrighted material} CONN., U. S. A.